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THE UNIVERSITY OF ALBERTA

FISCAL EQUALIZATION OF SCHOOL SYSTEM REVENUES UNDER THE ALBERTA SCHOOL FOUNDATION PROGRAM 1961-1971

by

© DONAL DEISEACH

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "Fiscal Equalization of School System Revenues under the Alberta Foundation Program 1961-1971" submitted by Donal Deiseach in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

Fiscal equalization was the principal aim of the Alberta School Foundation Program from 1961 to 1971. The purpose of this study was to assess the degree of fiscal equalization achieved under the finance program. Two major questions guided the inquiry: (1) Was the property tax burden for basic school support evenly distributed among the residents of Alberta in the period studied?; and (2) To what extent did equalization in the apportionment of foundation grants to school systems occur between 1961 and 1971?

Equalized property assessments and personal incomes in 1966 and 1969 were compared for school systems grouped by census division. Positive correlations between the two variables were found for the rural census divisions, but no sizeable correlations emerged when the five major city census divisions were included. It was concluded that the basic school tax burden tended to be equalized among rural areas under the Alberta Foundation Program for the period studied. A conclusion regarding disequalization of the school tax burden between city and rural areas was not formed because it was thought that the reported personal income of city residents could not be compared to that of rural residents.

Equalization in grant apportionment meant, for the purpose of this study, a tendency towards equality in foundation payments per weighted pupil among school districts. Four sub-problems were contained in this portion of the study and the years 1962, 1964, 1966, 1968, 1970 and 1971 were used in the analysis of each problem. The first sub-problem concerned the distribution of foundation payments per weighted pupil among school districts in the years selected. Distributions were found to be typically leptokurtic with a strong clustering about the mean value in each year. The tendency was not as pronounced under the transitional Foundation Program in 1970 and 1971 as it was under the 1961-1969 formula. A small number of school systems at the extremes of the distributions were examined. Small enrolments and remote location were the distinguishing characteristics of these systems.

For the remaining sub-problems, three techniques for assessing equalization in grant apportionment were employed. The univariate mode was used with the second sub-problem to compare the variability of foundation payments per weighted pupil for each year. The bivariate mode was used with the third sub-problem to examine the fiscal neutrality, or independence of grant revenues and fiscal ability, of the grant distributions. In the fourth sub-problem an attempt was made to identify factors accounting for differences in grant payments by using a multivariate mode with multiple step-wise regression analysis.

A trend of decreasing variability in foundation payments per weighted pupil was found to exist from 1962 to 1968, and the variability increased again in 1970 and 1971 with the revised finance formula. The degree of fiscal neutrality in the distribution of foundation grants increased from 1962 to 1968 and decreased in 1970 and 1971. The most important predictors of differences in foundation payments were the adjustment grant in 1962 and 1964, and the teacher grant in 1966 and 1968. A general conclusion of the study was that, for the majority of school districts, equalization of grant revenues occurred under the Alberta Foundation Program.

Several implications for school finance in Alberta were discussed and some suggestions for further research were made.

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CHAPTER I

PURPOSE OF THE STUDY, THE PROBLEM, AND DEFINITION OF TERMS

INTRODUCTION

The Report of the Royal Commission on Education in Alberta (Cameron, 1959, 10) noted that there was a general concern over equality of opportunity for all youth in the Province. The Commission emphasized the importance of school grants for attaining this goal in the following terms:

> The Commission has given vigorous support to the equalization of educational opportunities for all children — through expanded curriculum and access to well-qualified teachers. The abilities of school boards to achieve these conditions depends upon their tax resources and school grants. If a reasonably uniform quality of basic education is to be achieved in Alberta, the discrepancies in tax resources must be corrected by school grants. Equalization grants are vital in equalization of educational opportunity (Cameron, 1959, 275).

Following the recommendations of the Cameron Commission, the School Foundation Program Plan was introduced in Alberta in 1961. The new school finance program was proposed to the Legislative Assembly of Alberta on behalf of the government by the Minister of Education, the Honorable A. O. Aalborg, on February 27th, 1961. He enunciated the following principles for the program:

(1) The main grant should be of an equalization type;

(2) Its purpose should be to raise local school revenues up to some previously defined level;

(3) The previously defined level, known as a foundation program, should be set realistically so that it compares closely to the costs of essential services at current prices;

(4) All school units should raise tax funds at a common mill rate in order to provide their share of the foundation program; and

(5) The balance of the foundation program should be secured by grant (Speech to the Legislative Assembly, Feb. 27, 1961).

Implied in this statement is the notion of "fiscal equalization", that is, equalization of grant revenues to school boards relative to the costs of essential services.

The 1961 School Foundation Program Plan remained in effect, with some changes in regulations, until 1969. In that year, the Minister's Committee on School Finance was formed to examine the grant-in-aid scheme and make recommendations for its improvement. The Committee emphasized the equalization principle as follows:

> A provincial plan for financing education should have as one of its major objectives the achievement of equalization of educational opportunity (Minister's Committee on School Finance, 1969, 14).

Endorsement of the Report of the Minister's Committee on School Finance by government indicated that equalization of education opportunity was a continuing aim in financing public elementary and secondary schools of the province.

A revised form of the Foundation Program, based on the Committee's proposal, was introduced for the three-year period, 1970 to 1972. While the new grant scheme differed from the previous formula in the manner of allocating funds to school boards, it was intended to serve the same overall aim - "to provide greater fiscal equalization" (Minister's Committee on School Finance, 1972, 22).

PURPOSE OF THE STUDY

The purpose of this study is to examine the extent of fiscal equalization under the School Foundation Program in Alberta between 1961 and 1971.

In order to clarify the intent of the study, it is important to distinguish between two possible interpretations of "fiscal equalization". Firstly, fiscal equality may be deemed to occur when the grant provided to all school boards is sufficient to cover the financial outlay on essential services. Since the extent of essential services required in school systems varies according to the size of the pupil population and the nature of programs offered, the grant allocation based on essential services as determined by the province could result in variations in per pupil grants at the local level. However, the equity principle can be regarded as satisfied in that the financial requirements for provincially approved programs of all school boards are fulfilled. This was the writer's understanding[1] of the kind of fiscal equalization implied by Aalborg's statement of principles for the school finance plan (Supra, p.2).

Secondly, fiscal equality may be defined in terms of some unit of need: equalization of grant per pupil, per teacher or per classroom. In this study, the "weighted pupil" (Johns and Morphet, 1960, 271) was used as the unit of educational need in a school system. The criterion of fiscal equalization, for the purpose of this study, was that the same dollar amount per weighted pupil be provided to school systems under the grant scheme.

---

1. Based on an interview with Mr. A. Bredo, Director of Finance, Statistics and Legislation, Department of Education, Edmonton, Alberta, June 19, 1973.

Because the interpretation of fiscal equalization used differed from that set out for the Alberta Foundation Program, it was not the aim of this study to assess the extent to which policy objectives were achieved under the grant plan. Rather, the purpose was to examine the impact of the grant in terms of the weighted pupil criterion, and to determine the effects of changes in the grants formula. This study can, therefore, be considered as a normative evaluation of the Alberta Foundation Program because it was concerned with the operation of the grants scheme in relation to an arbitrarily chosen criterion.

STATEMENT OF THE PROBLEM

The general problem considered in this study was to determine the extent to which fiscal equalization was achieved under the Alberta Foundation Program. Two aspects of the problem were examined: (1) equalization of the school tax burden, and (2) equalization in the apportionment of grant monies.

Equalization of the Tax Burden

Equalization of the tax burden implied that school systems were required to support education in proportion to their ability to pay. A school district's fiscal ability under the Foundation Program in Alberta was measured by the equalized valuation of real property, residential and commercial buildings, farm land, electric power lines, and oil pipelines in the district (Cross, 1971, 10). The annual local contribution to the School Foundation Program Fund consisted of the revenues derived from a uniform tax levy on equalized property assessments of school districts. Hence, equalization of the tax burden was assumed to occur because a district's contribution, by which it qualified for a common level of foundation funds, was proportional to the equalized property valuation in the district.

However, there is some doubt about the adequacy of property as a measure of ability to pay taxes since "the amount of real property held by an individual is no longer a reliable indicator of the current wealth or income of an individual" (Worth, 1972, 286). Since taxes are paid from current income, personal income is frequently considered to be the most practical measure of taxpaying ability (Due, 1963; Listokin, 1968).

A major question in this study was whether equalization of the tax burden in terms of the proportion of personal income paid in basic school taxes occurred under the Foundation Program. The approach taken was to compare the two measures of taxpaying ability, equalized property assessments and personal income, in Alberta school systems.

Equalization in Grant Apportionment

A central theme in school finance literature since the early 1920's was that a comparable dollar amount should be provided to all school systems in order to achieve the dual purpose of equalization of educational opportunity and equalization of the school tax burden (Harrison and McLoone, 1965, 85). Reducing the school board revenues to a common measure, such as the number of dollars per pupil, enabled cross-sectional and longitudinal analysis of school finance systems to be m made: different finance programs were compared for a given year, and the same finance program was studied for different years.

Under the Alberta Foundation Program, basic grants were paid to school boards on a formula which incorporated cost factors. The principal cost factors were pupils by level of schooling, and teachers by level of professional preparation. These factors helped to differentiate among school boards on the basis of program needs. However, the use of a formula for grant disbursement in Alberta made it difficult to study the Foundation Program on a longitudinal basis. The cost factors represented partial measures of program needs when a unitary measure was required: not only because of the problem of determining the net effect of a number of partial grants, but also because new cost factors were introduced into the formula in succeeding years. In order to provide a criterion by which to assess fiscal equalization, the weighted pupil unit was adopted in this study as a measure of educational need in school districts.

Grant apportionment was explained in terms of the dollar amount per weighted pupil received by school systems under the Foundation Program. The first sub-problem asked what the distribution of foundation payments per weighted pupil was among school boards for each year selected. Was the variation in foundation payments per weighted pupil large or small for a given year? Following this, a second question was concerned with the variability in foundation payment per weighted pupil across years. Changes in the foundation formulae, such as the addition of a new cost factor or an increased allowance for an existing one, may have affected the spread in foundation payments per weighted pupil among school boards. Did the variance in the level of foundation grants, and with it the degree of fiscal equalization in grant apportionment, increase or decrease with the passage of time?

The next sub-problem dealt with the relationship between fiscal ability of school districts and their foundation grants per weighted pupil. Because the amount received in some of the grant categories depended on a corresponding degree of local tax effort, it was possible that wealthier school boards received proportionately higher grants for some aspects of their programs. For example, some boards could have hired more highly-qualified teachers than other boards, and would have received a larger grant in the teacher category on this account. Did boards with higher revenue capacities receive larger grants per weighted pupil under the Foundation Program in any of the years selected? Alternatively, to what extent was grant apportionment independent of the taxpaying ability of school districts during the years studied?

The last sub-problem in the study was to identify some significant predictors of variation in foundation payment per weighted pupil. Specifically, to what extent did school district size, taxpaying ability, local tax effort, operational expenditure per pupil, average teacher salary and pupil-teacher ratio, account for differences in foundation payment per weighted pupil in each of the selected years?

Importance of the Study

The Minister's Committee on School Finance (1969) recommended that research be undertaken on the Foundation Program in Alberta that would provide further insight into the operation of the formula and contribute to its improvement. The present study is one response to that suggestion.

The first part of the study, concerned with the equalization of the property tax burden, focussed on equalized property assessments and personal income as measures of a school district's ability to support education. Particular importance was attached to the relationship between these two variables because they were thought to be fundamental to the equalization impact of the finance program. This issue was pertinent to recent concern about the incidence of the property tax in Alberta, especially with regard to low income groups (Task Force on Provincial-Municipal Fiscal Arrangements, 1972, 6).

The second part of the study, equalization in grant apportionment, examined the allocation of foundation funds on a per weighted pupil basis. This approach to assessing the past performance of the Foundation Program seemed relevant in view of Alberta's adoption of a weighted pupil unit for the distribution of the major portion of foundation grants in 1973. One question in this part of the study dealt with the relationship between the fiscal capacity of a school board and its foundation revenues. Did wealthy boards receive relatively more funds than poor boards under the finance plan? In this respect, the National Education Finance Project study on equalization tendencies of school finance programs in the United States suggested that:

> . . . the avowed purpose of a finance program may not always be carried forth by the formula chosen to distribute the funds. State equalization or foundation programs, in particular, have sometimes been assumed to fiscally equalize among school districts when, in fact, little equalization of resources has taken place through the use of the formulas (Johns and Alexander, 1971, 173-174).

Another merit of the study was that in it a concept of fiscal equalization was applied which enabled statements to be made about the comparative degree of equalization that occurred under the Foundation Program in different years. This approach is different from the one taken by Hanson (1971) in his review of the Alberta Foundation Program in the 1960's, or that taken by Pike (1971) in his study of the 1970 program. Several writers on educational finance (Hickrod, 1971; Johns et al.,1971) have stressed the importance of longitudinal assessment of school grants programs. The statistical procedures used in the present study allow for longitudinal and cross-sectional analysis of data, and, it is hoped, will contribute to methodology in the field of school finance.

DEFINITION OF TERMS

Foundation Program. A foundation program denotes a type of grant-in-aid from a provincial government to the local school boards under its jurisdiction in support of a minimal (foundation) level of educational services in public elementary and secondary schools. The chief characteristics of a foundation program are:

(1) the cost of a basic program was ascertained by the province;

(2) a uniform tax rate was set as a compulsory levy on all school districts;

(3) where local revenues were insufficient to meet the cost of the basic program, the balance was supplied from provincial funds; and

(4) districts willing to provide for expenditures beyond the basic level could do so through a supplementary requisition on local property.

School Foundation Program Plan. The major grants-in-aid scheme to education in Alberta since 1961 was known as the School Foundation Program Plan.

School Foundation Program Fund. The School Foundation Program Fund, instituted in 1961, was comprised of revenues collected through a uniform yearly provincial levy on real property and an annual legislative appropriation from the general revenues of the province.

School Foundation Program Regulations. The School Foundation Program Regulations were struck annually by order-in-council to provide for the distribution of funds to school boards from the School

Foundation Program Fund.

Foundation formula. In this study, foundation formula referred to the set of grant categories, pupils, teachers and so on, which was used as the basis for grant disbursement under the School Foundation Program regulations.

Foundation payment. For the purpose of this study, foundation payment referred to the amount of money which was paid to a school system in a given year from the School Foundation Program Fund in support of the educational program in its schools. Allowances for transportation and maintenance of pupils, and for debt servicing were not included in the calculation of the foundation payment in the present study.

School system. School system was the term used in this study to describe any public school jurisdiction in Alberta, including a county, a school division, and a public or separate school district.

Property. In the context of this study, property means land, residential and commercial buildings, power transmission lines and oil pipelines.

Equalized property assessment. Assessment of all real property in Alberta was standardized through the province for grant purposes under the School Foundation Program Plan and the Alberta Hospitals Act (Cross, 1971, 10-11). A team of assessors, using extensive guidelines provided in a manual, set property values for municipal and school districts. The sum of the resulting valuations was known as the equalized property assessment of the district.

Ability to pay. In this study, ability to pay or taxpaying ability refers to the capacity of a school system to raise property taxes for school support. The principle of ability to pay is an "almost universally" accepted standard of equity (fairness) in distribution of the tax burden (Due, 1963, 168). According to this principle, as it is applied in the study, school systems with greater ability to pay should raise more taxes for education than those with fewer fiscal resources.

Supplementary requisition. School jurisdictions wishing to provide services in excess of the minimum program could set an additional mill rate for their districts over the uniform provincial levy; additional revenue thus acquired was called the supplementary requisition.

Tax effort. The tax effort of school system, in the present study, represented the degree to which the electorate in the district were willing to tax themselves for education expenditures beyond the foundation level.

System size. In the present study, size of school system referred to the total number of pupils to be educated. Indian pupils were included in the pupil enrolment figure used as the measure of school system size.

Eligible enrolment. The eligible enrolment of a school system was the number of pupils for whom the school board was entitles to receive financial support from the School Foundation Program Fund. The children of Indians and Department of National Defense personnel were not included in the eligible pupil count.

Weighted pupil units. The weighted pupil unit was a means of expressing a system's enrolment at all levels of schooling, elementary, junior high and senior high school, as an equivalent number of elementary pupils. For example, the weighted pupil count for a school district was found by summing the following:

Number of elementary students
+ (number of junior high students x a)
+ (number of senior high students x b)

where a and b were the program cost ratios applicable to the eligible enrolment in the finance formula.

Census division. For the purpose of taking census in Canada, every province is divided into a number of geographic enumeration units, each of which is called a census division.

Personal income. Personal income, in this study, denotes the amount of money available to taxpayers for consumption or investment before payment of income taxes.

Operational expenditures. This is the amount of money school systems spend on the operation of schools, and does not include, for the purpose of this study, transportation, pupil maintenance and debt servicing costs.

Average teacher salary. The quotient of instructional salaries and expenses, as recorded in the Department of Education Annual Report, divided by the number of teachers, is designated as the average teacher salary in a school system for the purpose of this study.

Pupil-teacher ratio. The quotient of total enrolment divided by the number of teachers is used to describe the pupil-teacher ratio in a school system for the purpose of this study.

THE RESEARCH SUB-PROBLEMS

The major problems of the study were recast in the following researchable questions :

Equalization of the Tax Burden

What was the relationship between equalized property assessments per capita and personal income per capita in the school systems of Alberta during the period under study?

Equalization in Grant Apportionment

1. What was the distribution of foundation payments per weighted pupil among Alberta school systems in the years selected for this study?
2. What was the relative variation in foundation payments per weighted pupil in these years?
3. Did the wealthier school systems receive relatively larger grants per weighted pupil?
4. To what extent did school district size, taxpaying ability, local tax effort, operational expenditure per pupil, average teacher salary and pupil-teacher ratio, account for differences in foundation payments per weighted pupil among school systems in the years selected?

ASSUMPTIONS

In a normative study, where a set of events is held in contrast to an alternative possibility, an assumption is sometimes made about the desirability of the criterion. Two preferred positions were postulated in this study. First, it was assumed, with support from the literature, that personal income represented a better measure of taxpaying ability than did real property valuation. Second, the weighted pupil unit was taken as the basis for measuring educational need in a school district. This assumption was based on the necessity for a unitary measure of educational need in the study in order to allow longitudinal analyses to be made.

The adoption of a weighted pupil system of distributing grants for instructional purposes under the 1973 Foundation Program in Alberta provided further justification for this choice.

A selection of years was made in the study to examine the Foundation Program from its inception in 1961 to the end of 1971. An assumption was made that the years chosen were sufficient for a longitudinal analysis of the finance plan, and that similar conclusions would have been reached if all the years were studied.

On a more specific level, an assumption was made in the derivation of two variables, foundation payment and operational expenditure. These amounts referred to revenues and expenditures on the school program only and did not include pupil transportation and debt servicing. Therefore, to obtain the figure for foundation payment to a school district, the costs of pupil transportation and debt servicing were subtracted from the total amount paid to the district from the Foundation Program Fund in a given year. This procedure was thought appropriate since over ninety percent of transportation costs and all legitimate debt charges were reimbursed from the Fund. In a similar way, operational expenditure for a district was obtained by subtracting pupil transportation and debt servicing costs from the total expenditure on current account in a given year. The assumption was that the residual fraction of the cost of transporting pupils would not appreciably lower the level of foundation payments or operational expenditures in any one school district relative to the other districts. The following consideration was used to support this contention. Hanson (1971, 18) found that pupil transportation and maintenance accounted for 8.5 percent of total current expenditures in all school districts in 1961, and 6.4 percent of total current expenditures in 1969. Ten percent of pupil transportation and maintenance cost represented 0.85 percent of total current expenditures in 1961 and 0.64 percent of total current expenditures in 1969. The error, due to a maximum of ten percent of pupil transportation costs, which was not reimbursed from the Foundation Program Fund, in the derivation of foundation payment per weighted pupil or operational expenditure per pupil was likely to be quite small.

LIMITATIONS

A major limitation on this study was that it was a case study of a particular school finance system during a discreet period of time. The trends in school finance under the Alberta Foundation Program could not be taken to show what occurred in other provinces of Canada. However, the findings of this study have implications for school finance in the other provinces to the extent that similarities exist in the provincial-local partnership for school support.

An attempt was made in this study to measure the extent of fiscal equalization under the Alberta Foundation Program using the weighted pupil criterion. This interpretation of fiscal equalization may not have been the one implied by government policy. Also, the Foundation Program was only one of a number of government policies in the field of public education. Other policies governed such things as the re-organization of school jurisdictions and teacher education. Consequently, this study was not conceived as a critical assessment of the Foundation Program as an instrument of policy. Rather, it was the application of a normative criterion for the purpose of examining the impact of the school finance plan in different kinds of school districts.

A further limitation was associated with the use of school districts grouped by census division, rather than single school districts, in examining the incidence of the property tax burden. This comparison of groups took no account of inter-district inequities within a census division that may have been present.

DELIMITATIONS

This study was delimited to a selection of years from the period 1961 to 1971. In examining the property tax burden, the years 1966 and 1969 were chosen. No year previous to 1966 was chosen because major boundary changes in the census divisions came into effect during that year (Alberta Department of Industry and Tourism, 1970). The year 1966 was chosen because it was a census year, and 1969 was chosen because, at the time of the study, it was the latest year for which income data were available.

Another delimitation applied to the population in the study. Only counties, school divisions and public and separate school districts were considered because these alone were funded through the Foundation Program. Other administrative units under the Department of National Defense and the Department of Indian Affairs, and private school, were not included.

The study involved revenue to school boards from the Foundation Program only. Other special purpose grants, which accounted for about six percent of the total revenue of school districts every year, were not taken into account. Nor were all foundation grants included in the analysis. Pupil transportation and maintenance costs, and debt charges were deducted from total foundation revenue of school districts because these amounts reflected specific local circumstances. The study was delimited to operational costs of school programs on the understanding that education begins at the school door.

References to property taxes in the present study are delimited to those property taxes used for school purposes only. No consideration is given to property taxes used for other purposes. While it is recognized that the school portion of the property tax may be influenced by the portion used for municipal purposes, this influence was considered to be exogenous to the study.

ORGANIZATION OF THE THESIS

The purpose of the study and a statement of the problems is contained in this, the first chapter. Chapter II is devoted to a review of literature related to the issues being studied. Chapter III is a description of the research methods employed in the study. The results of the data analysis are presented in Chapter IV. A summary of findings and implications for school finance is given in the final chapter.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter contains a review of pertinent literature and is organized in terms of the major problems introduced in Chapter I.

EQUALIZATION OF THE TAX BURDEN

When Cubberley (1905) first directed attention to the equalization principle in school finance at the beginning of the present century, he was concerned with equalization of the school tax burden (Johns and Morphet, 1960, 264-265). In order to devise a revenue system based on ability to pay, Strayer and Haig, originators of the foundation program concept, proposed the following:

(1) the cost of a minimum program is determined by the state;

(2) the tax rate required to fund the program in the richest district is ascertained;

(3) this tax rate is set as a compulsory levy on all districts; and

(4) the balance required to fund the program in all but the richest district is supplied from state revenues (Mort, Reusser and Polley, 1960, 204).

The Strayer-Haig proposal envisaged local collection of taxes on the uniform levy because of the difficulty of centralizing the administration of school funds without adversely affecting local control (Johns and Morphet, 1960, 265). However, there were two weaknesses to the plan. First, because of differences in assessment practices among districts, the validity of property valuation as a measure of ability to pay was questionable. Second, it was pointed out by H. Thomas James (Johns and Morphet, 1968, 281) that a substantial amount of property was not carrying its fair share of the burden for school support because some wealthy districts, who could finance their programs without foundation funds, were not required to levy taxes at the mandatory rate. James advocated that a standard assessment procedure should be used in all districts to improve the measure of fiscal ability, and that the state should act as a central collection and redistribution agent for foundation program monies (Johns and Morphet, 1968, 281). The latter proposal, in effect, converts local revenue into state funds and allows for the reallocation of excess funds from wealthy to poor districts. The scheme has been labelled the "Robin Hood" equalization program and was reckoned to be politically infeasible (Listokin, 1972, 57): it was not introduced in any of the states (Johns and Morphet, 1968, 281). However, Alberta instituted central collection and redistribution of tax revenues with the Foundation Program in 1961.

Equalization of property valuations was a long-time concern in Alberta. Assessment authorities had been performing equalizations for almost forty years to ensure some degree of tax equity in enlarged school and hospital districts (Brown, 1970, 20-23). Manuals were developed, and construction methods and retail market values of property were under continuous review. Since 1961, attention to assessment procedures became more important because of the new Foundation Program. According to the Alberta Assessment Equalization Board, the primary purpose of equalized assessments was to provide an equitable basis on which municipalities contributed to the School Foundation Program Fund (Cross, 1971, 10).

Recently, some doubt was expressed about the adequacy of equalized property assessment as a measure of local fiscal ability (Worth, 1972, 293). The Minister's Committee on School Finance expressed the view that:

> . . . funds to support the foundation fund should be derived from tax sources that bear an equitable relationship to the sources of income of the citizens of the province. While at one time real property holdings might have been a valid measure of the ability to pay of the citizenry in general, today this is no longer the case (Minister's Committee on School Finance, 1972, 33).

The above generalization may have been too broad. Atherton, Hanson and Berlando (1969, 37) suggested that a distinction be made between urban and rural property assessments. In urban areas, where the ownership of land was more a matter of consumption that investment, the value of property could not be considered as a true reflection of the income earning capacity of residents. In rural areas, on the other hand, the ownership of land was still a form of investment and, as such, was still a good indicator of income potential. The Minister's Committee on School Finance concluded that differentials in assessment between urban and farm lands had partially offset the impact of the uniform levy in equalization of the school tax burden (Minister's Committee on School Finance, 1969, 34).

The argument over which measure of taxpaying ability to adopt, that based on property values or that based on personal income, is redundant if these are highly correlated. But several studies (James, Thomas and Dyck, 1963, 7-8; Hickrod and Sabulao, 1969, 40-41; Johns and Alexander, 1971, 90) found no relationship between the two measures of ability. Frequently a condition of high income areas with low property assessments was identified. This condition revealed the existence of tax havens where more revenue would have been made available for education if personal income was used as the measure of ability to support schools.

EQUALIZATION IN GRANT APPORTIONMENT

Measurement of Equalization

School finance studies since the early 1920's were concerned with the equalization impact of grants-in-aid programs (Harrison and McLoone, 1965), yet little agreement was reached on how to measure equalization (Johns and Salmon, 1971). Hickrod (1972, 23) suggested that the measurement of equalization could be classified under either the univariate mode or the bivariate mode.

In the univariate mode, variations among school districts on a single variable are studied. Variations can be measured in terms of expenditure per pupil, fiscal capacity, or grant revenues per pupil among school districts, depending on the question under study. Both the mean (Hickrod and Chaudhari, 1973) or the median (Harrison and McLoone, 1965) have been used as measures of central tendency. A change toward equalization in the univariate mode results in a reduction in variation from the mean or median. Where relative variation at different points in time has been of concern, a descriptive statistic, the coefficient of variation, has been used (James, 1961). A diminishing relative variation has been interpreted as a trend towards homogeneity among school districts on the particular variable chosen (Hickrod and Chaudhari, 1973).

Equalization in the bivariate mode is concerned with the relationships between two variables, particularly expenditure per pupil in school districts and property valuations per pupil. The question asked is whether expenditure is related to fiscal ability. The concept of equalization applicable to this approach derives from the principle of fiscal neutrality. Disequalization increases as the distribution of revenues or expenditures departs from a position of fiscal neutrality. Fiscal neutrality, as interpreted by recent court decisions related to school finance in the United States, means that school district expenditure should not be a function of wealth other than the wealth of the state (Saturday Review, November 20, 1971). In Alberta, the principle of fiscal neutrality can be applied to the relationship between foundation grants and the fiscal abilities of school boards since under the Foundation Program all boards were entitled to "the same basic level of support regardless of their revenue capacities" (Aalborg, 1961).

To measure the deviation of revenues from a condition of fiscal neutrality, Hickrod (1972, 26) advocates the use of the gini coefficient or "index of concentration". An increase in the gini coefficient from one year to the next indicates a greater departure from fiscal neutrality and an increase in disequalization. The gini coefficients are purely relative, one to the other, and can be used only in comparing the distribution of funds in different years or different distributions in the same year. Several studies (Harrison and McLoone, 1963; Wilensky, 1970; Hickrod and Chaudhari, 1973) have made use of this descriptive statistic.

An extension of the typology to the multivariate mode was a particular departure taken in this study. Previous studies of equalization tendencies of school finance programs were limited to identifying whether or not equalization occurred. Further enquiry into the possible reasons of disequalization and to what extent it may have been justified was rare. Miner (1963) pointed out that a school district's ability to support education was only one of a number of factors that could account for differences in expenditure per pupil among districts. Miner held that a multivariate approach was necessary to assess the relationship between expenditure and ability in order to take account of other social and economic factors related to school spending. In this study the multiple regression analysis was used to determine whether school district ability, among other factors, was a significant predictor of differences in foundation payment per weighted pupil.

Six factors were chosen in this study in an attempt to explain why differences in foundation payment per weighted pupil occurred in each of the selected years. These were: (1) size of school system, (2) fiscal ability of school system, (3) tax effort made by school system, (4) operational expenditure per pupil for school system, (5) average teacher salary in school system, and (6) the pupil-teacher ratio in school system.

In this study the size of a school system was defined in terms of the total number of pupils to be educated. The bigger school systems have a greater degree of freedom to allocate financial resources in such a way as to maximize foundation payment per weighted pupil. For example, the marginal increase in per pupil expenditure required to hire a full-time school librarian is, ceteris paribus, inversely proportional to the size of a system. Since an additional allowance was made for a librarian under the Foundation Program regulations, a school district could sacrifice some aspect of the educational program in order to hire a librarian and qualify for higher foundation payments per weighted pupil. Presumably, this sort of adjustment would be easier to make in the bigger school systems. Some evidence that this may have occurred was provided by Holdaway (1971, 32) who found that larger school systems in Western Canada tended to have a higher proportion of staff in supervisory and pupil-oriented support positions.

The fiscal ability of a school district was defined in this study as the equalized assessment per pupil in the district. Most studies of fiscal capacity and tax effort of school districts have used property assessment per pupil as the criterion of fiscal capacity and the property tax rate as the criterion of fiscal effort (Johns and Alexander, 1971, 83). Differences in foundation payments per weighted pupil may have come about if wealthier school systems were better able to make use of the provisions in the grant formula to qualify for a higher level of funding than districts of less fiscal capacity. For instance, a wealthy district could have maintained a low pupil-teacher ratio and obtained a bigger foundation payment per weighted pupil on account of the teacher allowances in the formula. Coons, Clune and Sugarman (1970, 97-124) discussed the problem at length noting that some foundation programs were de facto disequalizing. They came to the conclusion that some distribution formulae were "flawed" in favour of wealthy districts to accommodate the political compromises preceding the passage of equalization legislation.

Tax effort, for the purpose of this study, was defined as the supplementary requisition mill rate in a district. When the revenues from the Foundation Program Fund were insufficient to finance the educational service, a school board could raise the balance of its requirements by an additional levy on local property, the supplementary requisition. Hanson (1971) found that between 1961 and 1969, there was a steady increase in the proportion of total school board revenues derived from supplementary requisitions. School Foundation Program Fund revenues accounted for 91.2% of total operating revenues in 1961 but were down to 77.2% in 1969. At the same time, supplementary requisitions increased from 5.4% in 1961 to 16.9% of total revenues in 1969. This general increase in local tax effort may have contributed to differences in foundation grants in that wealthier school districts were able to take advantage of the cost factors in the formula to an increasing extent. In their evaluation of the 1961-69 Foundation Program, the Minister's Committee on School Finance made the point:

> While the supplementary requisitions remained low, fiscal equalization was generally attained. As supplementary mill rates increased, equalization was less prevalent (Minister's Committee on School Finance, 1969, 34).

However, it was not always possible for boards with high fiscal ability to hire highly qualified teachers in order to receive more foundation revenue per weighted pupil. The Department of Education Annual Reports indicate that there was a shortage of qualified teachers in Alberta between 1961 and 1969. Two comments in this regard were:

> A number of superintendents reported that the shortage of qualified teachers led to the placement in their system of a greater number of ex-teachers than ever before and that many of these required extensions of letter of authority and teaching privileges (Annual Report 1966, 15); and

> Although a number of superintendents reported that complete staffs were available for the opening of school, many reported that considerable difficulty was experienced in securing an adequate supply of qualified teachers (Annual Report 1968, 21).

These comments illustrated a condition in teacher supply which would have decreased the possibility of the teacher category being a disequalizing element in the formula.

Operational expenditure per pupil indicated the level of spending for the educational program of a school district and did not include pupil transportation costs and debt charges. This variable was entered into the regression analysis to discover whether there was any correspondence between foundation payments and program expenditures. In a review of studies on local demand for education, Hickrod (1971, 35-49) found wealth variables to be the most consistent determinants of school spending. State aid was an important predictor in some studies but not in others. Hickrod concluded that grant revenue had at best a weak influence on local expenditure decisions.

The last two factors in the regression analysis, average teacher salary and pupil-teacher ratio, may also have contributed to variation in foundation payments per weighted pupil among school systems. A school board could have qualified for a high level of foundation payment by employing teachers with more years of professional preparation, and increasing the average teacher salary for the district; or by simply hiring an extra teacher and reducing the pupil-teacher ratio in the district.

The School Foundation Program Regulations

An abbreviated version of the Foundation Program formula is included in this section: the actual grant regulations were more detailed. By simplifying the description, it was hoped that the underlying pattern of the formula would become clear. The purpose of the analysis was to arrive at some tentative conclusions on how the formula might have resulted in differences in foundation payment per weighted pupil.

The Foundation Program formula for the years 1961 through 1969 is given in Table I. Overall, the following seven grant classifications were used in the formula:

Part A - Instruction: (1) pupils, (2) teachers, and from 1964 onward (3) supervisors (including guidance counsellors and librarians), (4) intern-teachers, and (5) vocational classes;

TABLE I
SCHOOL FOUNDATION PROGRAM GRANT FORMULA 1961-1969

Grant Classification		1961	1962	1963	1964	1965	1966	1967	1968	1969
A INSTRUCTION										
(1) Per pupil by grade	I-IV	$105	$130(1.0)	$130(1.0)	$230(1.0)	$238(1.0)	$250(1.0)	$255(1.0)	$266(1.0)	$280(1.0)
	VII-IX	105	170(1.3)	170(1.3)	230(1.0)	240(1.0)	270(1.1)	310(1.2)	323(1.2)	340(1.2)
	X-XII	105	250(1.9)	250(1.9)	250(1.9)	260(1.1)	300(1.2)	360(1.4)	375(1.4)	412(1.5)
(2) Per teacher by years of training	0 - 2	$2,100	$2,100	$2,100	$200	$350	$700	$900	$900	$900
	2 - 3	2,400	2,400	2,400	750	900	1,350	1,600	1,600	1,600
	3 - 4	2,700	2,700	2,700	1,500	1,650	2,100	2,400	2,400	2,400
	4 - 5	3,000	3,000	3,000	2,500	2,650	3,100	3,400	3,400	3,400
	5 - 6	3,400	3,400	3,400	2,800	2,950	3,400	3,600	3,600	3,600
	6 or more	3,700	3,700	3,700	3,100	3,250	3,700	3,900	3,900	3,900
(3) Supervisor, specialist					$1,500	$1,500	$1,500	$1,500	$1,500	$1,500
(4) Intern teacher					/		$5.00 per day			
(5) Vocational classes	- per room				$1,000	$1,500	$1,500	$1,500	$1,500	$1,500
	- per pupil				100	150	150	180	180	180
	- per extra-district pupil				100	100	100	150	150	150
B Plant maintenance per teacher		$1,000	/ discontinued							
C Instructional materials per teacher		300	/ discontinued							
D Pupil transportation & maintenance		(AC = approved costs)								
Non-city districts		100% AC[1]	90% AC	90% AC	/	three year moving average of actual costs				
City districts		90% AC	90% AC	90% AC	90% AC	90% AC	90% AC	90% AC	90% AC	90% AC
Boarding allowance		$1.00 per pupil per day			/ discontinued					
E Administration		2% A to D[2]	2% A&D	2% A&D	2% A&D	2% A&D	2% A&D	2% A&D	2% A&D	2% A&D
F Debt retirement on capital and short-term current loans		100% ED[3]	100% ED	100% ED	100% ED	100% ED	100% ED	100% ED	100% ED	100% ED
G Adjustment (1962-1964 only)			/ difference between per pupil grant in 1961 and year			/ discontinued				

Sources: Government of Alberta, Foundation Program Fund Regulations 1961-1969

1. AC = Approved costs: expenditure on pupil transportation as required by The School Act
2. A and D refer to the grant classifications in the table.
3. ED = Eligible debt: short-term loans on current account and loans for capital purposes approved under the School Buildings Regulations

Part B - Maintenance of School Plant: discontinued after 1961;

Part C - Instructional Aids and Materials: discontinued after 1961;

Part D - Transportation and Maintenance of Pupils: (1) non-city (school divisions, counties and non-urban districts), and (2) city transportation categories, and (3) pupil boarding allowances (discontinued after 1963);

Part E - Administration: calculated as a proportion of the sum of A, B, C, and D in 1961, and on A and D in subsequent years;

Part F - Debt Servicing: debenture payments and short-term capital loans; and

Part G - Adjustment: used in 1962, 1963 and 1964 only to ensure that the per pupil grant in these years did not fall below the 1961 level.

The number of classifications remained fairly constant after 1961 when grants for school maintenance and instructional aids were discontinued. An adjustment allowance was included in the formula for 1962, 1963 and 1964. Modifications were made to the formula by increasing the unit grant in the different categories, and by the addition of further categories, supervisor-specialist, intern teacher, and vocational classes, in 1964.

Under the Instruction classification, Part A, of the formula, the allowance per pupil varied for elementary, junior high and senior high pupils after 1961. The figures in brackets denote the cost ratios in the per pupil grant relative to the elementary pupil allowance. Differences in foundation payment per weighted pupil among districts arising from differential allocation per pupil were not anticipated in this study since the cost ratios in the formula were used to arrive at the weighted pupil count for each school district.

The teacher grant, under Instruction, varied by the number of years of professional preparation. No change was made in the allowance scale during the first three years of the Foundation Program. In 1964, the scale was somewhat reduced for all qualification levels and the reduction was greatest for teachers with two years of training or less. The grant was increased again at all points of the scale in 1965, 1966 and 1967; and thereafter, it remained unchanged through 1969. This part of the grant formula constituted an incentive for school boards to hire more highly trained staff and was designed to encourage teachers to upgrade their qualifications. Differences in foundation payments per weighted pupil among districts could have resulted from the use of this grant category. Migration of the more qualified teachers to the cities would have resulted in higher grants per weighted pupil to the city districts. Hanson (1971, 39) found a marked trend towards an increase in the level of qualifications of teachers in the city districts in contrast to the non-city districts, under the Alberta Foundation Program. The Alberta Department of Education made the following comment:

> Other serious problems which were reported by some superintendents were - the difficulties in retaining competent and experienced principals and high school teachers in the rural and small urban centres when so many of them are attracted to teaching positions in the major cities (Annual Report 1961, 35).

The other categories under Instruction, supervisors, intern-teachers and vocational classes, provided for payment on a flat grant basis. If larger school systems were able to organize shop facilities or hire additional specialists and practising teachers more readily than smaller systems could, then a further disequalization in foundation payment per weighted pupil may have occurred. Evidence that large school systems in Alberta during the 1971-72 school year had a higher proportion of supervisors and specialists on staff than smaller systems was provided by Blowers (1972, 188).

In the two classifications, Part B and Part C, funds were paid for school maintenance and instructional supplies on a per teacher basis for 1961 only. Some inequalities may have arisen from this arrangement due to differences in pupil-teacher ratios. However, 1961 was not one of the years chosen in this study.

Grants under Part D, non-city and city transportation costs and pupil boarding allowances, reimbursed school boards to a minimum of 90 percent of actual expenditures on pupil transportation and maintenance. These allowances were not included in the foundation payment to districts in this study.

Disbursements for administration, Part E, were set as a proportion of total grants paid in the preceding classifications. To the extent that other parts of the formula gave rise to differences in foundation grants per weighted pupil among districts, the administration allowance contributed also; but, due to the small dividend involved, to a minor degree.

The total cost of borrowing for debenture funding and short term capital loans, considered to be eligible debt under The School Act, was paid to school boards under Part F. Grants for debt servicing were not included in the foundation payment for the purposes of this study.

An adjustment allowance, Part G, was paid to school boards in 1962, 1963 and 1964. This arrangement was the continuation of a previous grant brought under the Foundation Program formula. In 1961, over 2½ million dollars in contingency grants, which were not a part of the Foundation Program Fund but were contributed from [illegible] general revenues of the Province, was distributed to certain school districts in order to facilitate the introduction of the new finance scheme. The status of these contingency grants was explained in a report to the Alberta School

Trustees' Association by the Department of Education (The Alberta School Trustee, 1961, July-August, 4-5). Their purpose was to enable boards to maintain a 1960 level of expenditure without increasing the millage of the local tax levy. This classification may have contributed to differences in foundation payments per weighted pupil in 1962 and 1964, with the high expenditure districts receiving a relatively higher level of grant.

The formula in effect for the three years 1970 to 1972 is shown in Table II. Except for Instruction, Part A, classifications were the same as those given in the previous table. The new basis for distributing funds under the Instruction classification was the major innovation in this form of the Foundation Program. Instruction grants were paid in two categories, classroom units (CRU's) and support staff. Cost differentials for different levels of schooling were applied to the CRU grant. A CRU was defined as twenty-six pupils, and a half-CRU as thirteen pupils. All eligible pupils of a district, whatever its size, were counted and the total was divided by twenty-six to arrive at the number of units of grant entitlement. If the remainder in this calculation exceeded thirteen, a further half-unit was allowed; but, no money was received for a remainder of less than thirteen. This procedure was known as truncation, and it may have been a source of differences in foundation payment per weighted pupil among school districts since the loss of revenue for the residual number of students was marginally greater for the smaller districts.

The second category under Instruction, namely support staff, allowed seven personnel per thousand pupils for grades one to nine, and eight per thousand in the high school. Support staff grants, unlike the teacher grants in the 1961-1969 formula, were not tied to teacher qualifications but to the number of students in a school district. To qualify for a support staff allowance, a school district had to have 143 pupils in grades one to nine or 125 students in grades ten to twelve. Differences in foundation payments per weighted pupil among school districts would have arisen because truncation was in effect. In addition, the larger allowance for high school support staff would have resulted in larger foundation payments per weighted pupil to school districts with a higher proportion of its student population in the high school grades.

The other grant classifications, Part B, C and D, remained substantially unchanged.

TABLE II
SCHOOL FOUNDATION PROGRAM GRANT FORMULA 1970-1972

Grant Classification		1970	1971	1972
		$10,150	$10,759	$11,405
A Instruction	I-VI	x1.0	x1.0	x1.0
per CRU	VII-IX	x1.2	x1.2	x1.2
(26 pupils)	X-XII	x1.8	x1.8	x1.8
per support staff	I-IX (7 per 1,000)	$10,200	$10,812	$11,461
	X-XII (8 per 1,000)	"	"	"
B Transportation		---- 90% approved costs --------		
C Administration		---- 3% of the sum of A and B ---		
D Debt retirement		---- 100% eligible debt --------		

Sources: Government of Alberta, Foundation Program Fund Regulations, 1970-1972.

Some modifications, not included in the table, were made to the formula for 1971 and 1972 in order to give additional assistance to small school districts. These were as follows:

(1) When district enrolment fell below 26, the Minister, at his discretion, could grant entitlement for a full CRU;

(2) A district qualifying for less than two support staff could classify all its pupils as Grades I-VI, and receive a maximum amount of $15,300 in 1970, $16,218 in 1971 and $17,192 in 1972;

(3) Two or more districts whose combined high school enrolment was not less than 125 eligible pupils, could share the services of a full-time superintendent or teacher-supervisor, and receive a payment of $10,812 in 1972 and $11,461 in 1972; and

(4) A small jurisdiction allowance, calculated as the product of eligible enrolment times rank order times seventy cents, was paid to districts with 1,000 or fewer students.

The combination of these allowances undoubtedly increased the foundation grant per weighted pupil in small districts. To some extent, this was a levelling up for poor districts. But, it also operated as a further benefit to small wealthy systems, thus attenuating differences in foundation grants per weighted pupil. However, the small jurisdiction allowances did not alleviate the situation of some small districts and it was noted that "disproportionately large increases in teacher-pupil ratios were used as a tactic to maintain the financing of otherwise uneconomic small and isolated schools (Annual Report 1972, 53)."

For the transitional Foundation Program 1970-72, regulations limiting requisitions were introduced (Regulations Limiting Requisitions, 1970). In effect, these regulations held the amount of money a school board could raise on supplementary requisition at the 1969 level with an escalation factor of 6% for 1971 and 1972. This clause tended to limit a board's use of increasing property valuations for discretionary revenues. Consequently, it was not anticipated that supplementary requisitions would have contributed to further disequalization in foundation revenues per weighted pupil in 1970 or 1971, the years chosen in this study to examine the impact of the transitional formula.

According to the Minister's Committee on School Finance, in evaluating the 1970 Foundation Program (1972, 22-27), greater fiscal equalization was achieved than under the 1961-69 formula: this was attributed to the cutback on supplementary requisitions and the larger proportion of total revenues from government sources.

SUMMARY

A review of literature pertinent to the two major problems in the study, equalization of the tax burden and equalization in the apportionment of grants, is presented in this chapter. An analysis of the School Foundation Program grant regulations for the years 1961 through 1972 is also included. Two general conclusions emerged from the literature review. First, the collection of school taxes through a uniform levy on equalized property assessments may not have brought about an equalization of the school tax burden in Alberta because property valuations may not have been a good indicator of the taxpaying ability of residents. Second, there were a number of ways in which variations in foundation payment per weighted pupil to school systems could have arisen through the operation of the finance formula. Increased variability in foundation payments per weighted pupil signifies disequalization in grant apportionment in the present study.

CHAPTER III

RESEARCH PROCEDURES

A brief description of the population under study, sources and treatment of the data, and an explanation of statistical techniques used are to be found in this chapter.

Population

The unit of analysis in this study was the school system, and the population comprised all school divisions, counties and districts in Alberta during the years selected. For the purpose of comparing equalized property valuations and personal income as measures of tax-paying ability, the school systems were grouped by census division. This was done because of the difficulty of obtaining income data for school systems.

Sources of Data

Most of the data used in this study were taken from published sources. All information on school system revenues, expenditures, enrolments and teachers was available in the Alberta Department of Education Annual Reports, with the exception of the eligible student count. The figures for this last item, on which Foundation Program grants were paid, were obtained from the records of the Department. Equalized property assessments for all municipal districts and cities of Alberta were obtained from the relevant issues of The Alberta Municipal Counsellor, a publication of the Department of Municipal Affairs. The municipal population figures for 1969 came from the same source. Similar population figures for 1966 were found [illegible] Census (1966), the compilation of census data for that year. Personal income in each census division was obtained from Taxation Statistics published by the Federal Department of Internal Revenue and Taxation.

Treatment of the Data

In examining the distribution of the property tax burden, the first problem in this study concerned the relationship between equalized property assessments per capita and personal income per capita in Alberta school systems. Equalized valuations of real property in school systems were summed up for each census division. Total equalized assessments and personal income figures for the census divisions were transformed to per capita amounts for comparability. The Pearson correlation coefficient was used to determine the relationship between these two variables and bivariate graphs were constructed also.

For the purpose of examining the allocation of grant monies under the Foundation Program, some adjustments were necessary in order to match enrolment and financial data. School accounts are reported for the calendar year in the Annual Reports while enrolments and the number of teachers are given for the school year, July 1 to June 30, based on the September 30 count. Expenditure per pupil was derived by dividing a system's total operational expenditures, less transportation costs and debt charges, by the average September count for two consecutive years. Similarly, the foundation payment per weighted pupil for a school system was calculated with a weighted pupil figure based on the average eligible pupil count made in the September of two successive years. The number of teachers, the pupil-teacher ratios, and the average teacher salary, were calculated in the same way.

The first sub-problem related to the question of grant apportionment dealt with the level of foundation payment per weighted pupil in the school systems. Six frequency distributions of foundation payment per weighted pupil were tabulated for each of the selected years in order to present the findings in this section. Further analysis was conducted by examining school systems which fell at the extreme ends of each distribution. The decision on what systems to select for secondary analysis was made when the frequency distributions of foundation payments per weighted pupil were scrutinized. A small number of school systems on the tails of each distribution was chosen for further analysis. The descriptor variables (pupil enrolment, equalized assessment, average teacher salary, etc.) associated with these extreme systems were examined in an attempt to identify some characteristics common to school systems with unusually high or low levels of foundation payment per weighted pupil.

The second sub-problem related to the question of grant apportionment dealt with the variability in foundation payments per weighted pupil in the different years of the study. Because the mean value of foundation payment per weighted pupil was different for each year selected, it would have been misleading to compare the standard deviations to assess the change in variability of foundation payment per weighted pupil from one year to another. What was required was a measure of relative variation. Relative variation was measured by a descriptive statistic, the coefficient of variation (Blalock, 1960, 73-74), defined as the standard deviation devided by the mean. Coefficients of variation are directly comparable, and larger coefficients signify greater variability in foundation payments per weighted pupil among school districts.

The third sub-problem was concerned with fiscal neutrality in the allocation of grants. In this study, the gini coefficient (Hickrod, 1972, 25-31), was used to describe the degree of neutrality in the distribution of foundation payments.

The gini coefficient can be described graphically by the Lorenz curve in Figure 1.

In constructing the graph, school systems are ranked initially in ascending order according to fiscal ability or the equalized assessment per pupil in each district. The horizontal axis represents the cumulative proportions of the total number of weighted pupils of school districts in rank order. The vertical axis represents the cumulative proportions of total foundation payments to school districts. Under a condition of perfect fiscal equalization, fifty percent of weighted pupils would receive fifty percent of foundation payments and the curve would fall along the diagonal. If wealthier districts receive a higher foundation payment per weighted pupil than poor districts, the curve bows downward as shown by the arrow. Conversely, if poor districts receive higher foundation payments per weighted pupil than wealthy districts, the curve falls above the diagonal. There are the two possible effects of non-neutrality in the distribution of foundation payments per weighted pupil. The measure of non-neutrality, the gini coefficient, is given by:

$$g = \frac{\text{Area } A}{\text{Area } (A + B)}$$

As area A increases, the value of g approaches unity and non-neutrality in favour of wealthy districts increases. When area A decreases, the curve comes closer to the diagonal and the value of g approaches zero. At zero value for g, a condition of perfect fiscal

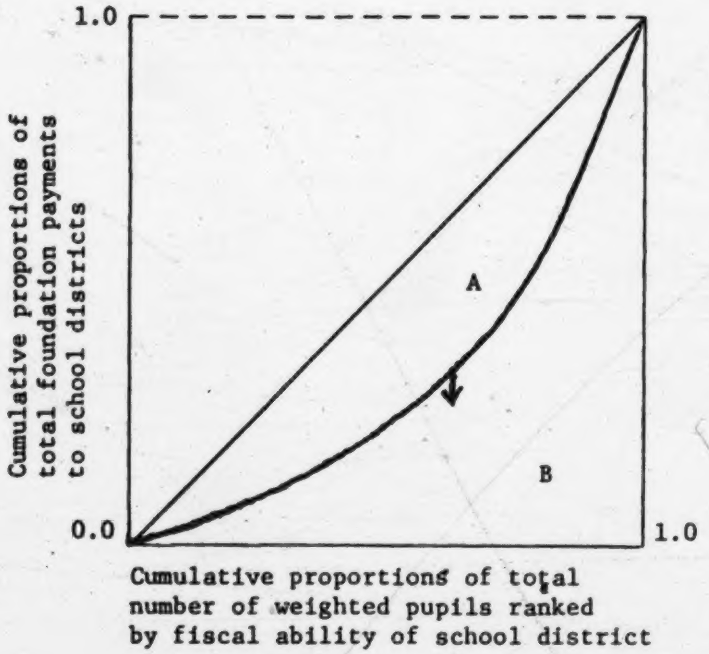

Figure 1: Effect of non-neutrality in distribution of foundation payments per weighted pupil shown by Lorenz curve in bivariate mode.

neutrality exists. The gini coefficient takes on a negative value when the curve falls above the diagonal. In order to calculate g, the following formula is used:

$$g = \sum_{i=2}^{n} (x_{i-1} \cdot y_i - x_i y_{i-1});$$

where x is a district's position on the horizontal axis; and y, on the vertical axis, is the proportion of total foundation payments accounted for by that district in conjunction with all those districts below it on the horizontal axis.

The g values are purely relative numbers which describe the relative non-neutrality of the grant structure and require no test for the significance of differences between them. Since g has a positive or negative maximum value of unity, any value of g can be interpreted as a percentage of absolute non-neutrality. That is, a distribution with a g of 0.14 can be expressed as 14 percent non-neutral. An advantage of the g statistic is that coefficients for different years, or coefficients for different distributions on the same measures in a single year, can be compared. If the gini coefficient decreases from year to year, the equalization impact of the finance formula increases and vice versa. This was the approach used to assess the trend in fiscal equalization of the Foundation Program in the present study. A computer program was devised to calculate the gini coefficients.

The final sub-problem related to grant apportionment concerned the identification of significant factors accounting for differences in foundation payments per weighted pupil among school systems. The method of analysis used was to enter the independent variables of enrolment, ability, effort, offering, average teacher salary and pupil-teacher ratio in a regression model with foundation payment per weighted pupil as the dependent variable for each year of the study. A stepwise regression technique (Carlson and Hazlett, 1968) was used to arrive at the solution. An advantage of this technique was that it enabled one to specify the probability level for the addition or deletion of incoming variables to the regression analyses. The acceptance-rejection level chosen in this study was $p = 0.05$.

SUMMARY

In the present chapter, various methodological considerations in the study are reviewed. The population in this study comprised all school systems in Alberta during the years selected. Most of the data was taken from provincial and federal government publications and the eligible pupil enrolments for school systems which were obtained from the records of the Department of Education. In examining the distribution of the property tax burden, the Pearson correlation was used to determine the relationship between equalized assessment per capita and personal income per capita in the census divisiors of the province. Four approaches were used to examine the allocation of grant monies among school systems in each of the years selected. First, six frequency distributions of foundation payment per weighted pupil were constructed and scrutinized. Second, the relative variability in foundation program per weighted pupil was found by using the coefficient of variation. Third, fiscal neutrality in grant apportionment was assessed with the gini coefficient. Lastly, multiple stepwise regression was employed to identify factors related to differences in foundation payment per weighted pupil among school systems in each of the selected years.

CHAPTER IV

RESULTS OF THE DATA ANALYSIS

This chapter contains the results of the data analysis and a discussion of the findings.

MEASURES OF FISCAL ABILITY

The first problem in this study was to compare two measures of the fiscal ability of school districts in Alberta, equalized property assessment and personal income. In operational terms, the question was expressed as follows:

> Was there a significant statistical relationship between the total equalized assessment per capita and the personal income per capita in the census divisions of Alberta for the years 1966 and 1969?

Findings

Coefficients of correlation between total equalized assessment per capita and personal income per capita in the census division of Alberta for the two years are presented in Table III. The values of the coefficients, 0.124 for 1966 and -0.102 for 1969, are quite low. This indicates that there was no sizeable relationship between total equalized assessment per capita and personal income per capita in the census divisions for either year.

Discussion

The inference from the above finding was that the ability of school districts to raise revenue from local property taxation was unrelated to the earning capacities of their electorates. Based on the assumption,

TABLE III

COEFFICIENTS OF CORRELATION BETWEEN TOTAL EQUALIZED ASSESSMENT PER CAPITA AND PERSONAL INCOME PER CAPITA IN CENSUS DIVISIONS OF ALBERTA, 1966 AND 1969

	1966	1969
	r	r
Total equalized assessment per capita versus personal income per capita, census divisions (N = 20)	0.124	-0.102

adopted in this study, that personal income was the best practical index of taxpaying ability, it was concluded that the tax burden for basic school support was not proportional to personal income. Since this meant, in effect, that equalization of the tax burden probably didn't occur in the years selected for study, additional analysis was undertaken.

Further Analysis

In order to analyse further the relationship between total equalized assessment per capita and personal income per capita in the census divisions, bivariate graphs were drawn. These are presented below as Figure 2 for 1966 and Figure 3 for 1969. On inspecting these graphs, it was apparent that for both years, a number of census divisions, which ranked above average on total equalized assessment per capita (the horizontal axis), stood well above the other divisions on personal income per capita (the vertical axis). This group of points, shown within the rectangle, represented the five major cities.

Coefficients of correlation between total equalized assessment per capita and personal income per capita were calculated once again without

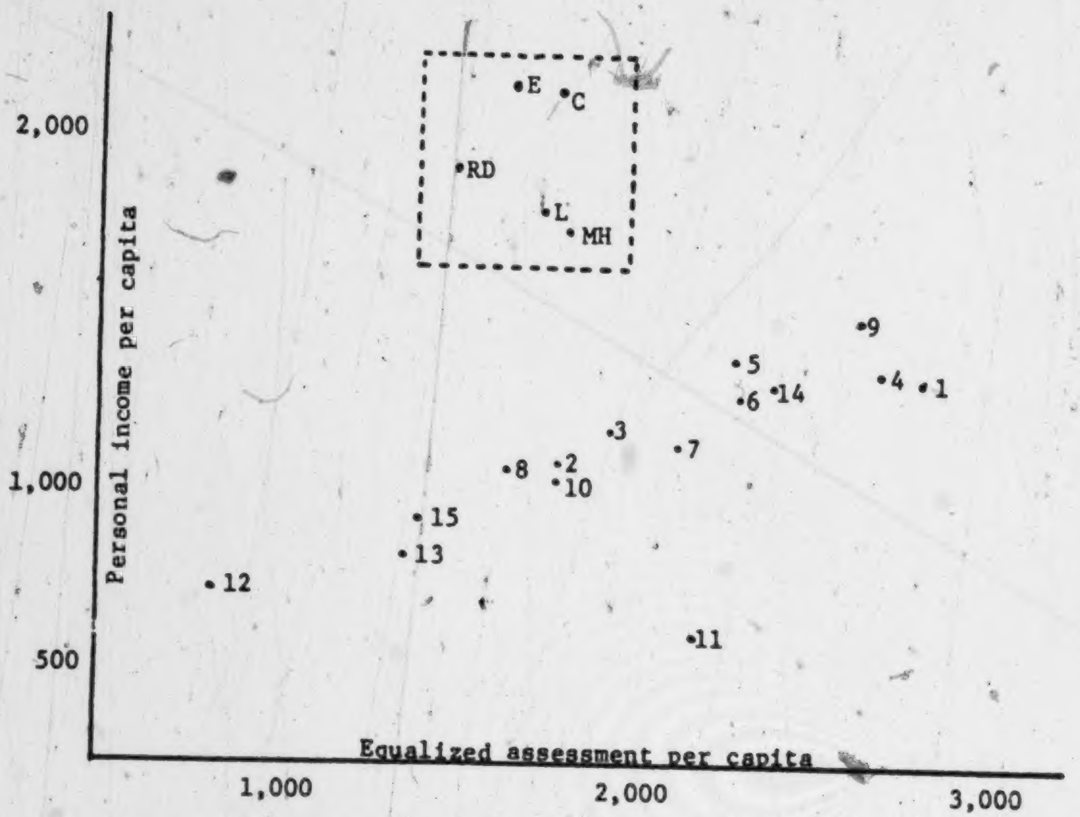

Figure 2: Equalized assessment per capita and personal income per capita by census division, Alberta 1966.

Legend: Numbers denote census divisions; E=Edmonton; C=Calgary; L=Lethbridge; RD=Red Deer; and MH=Medicine Hat.

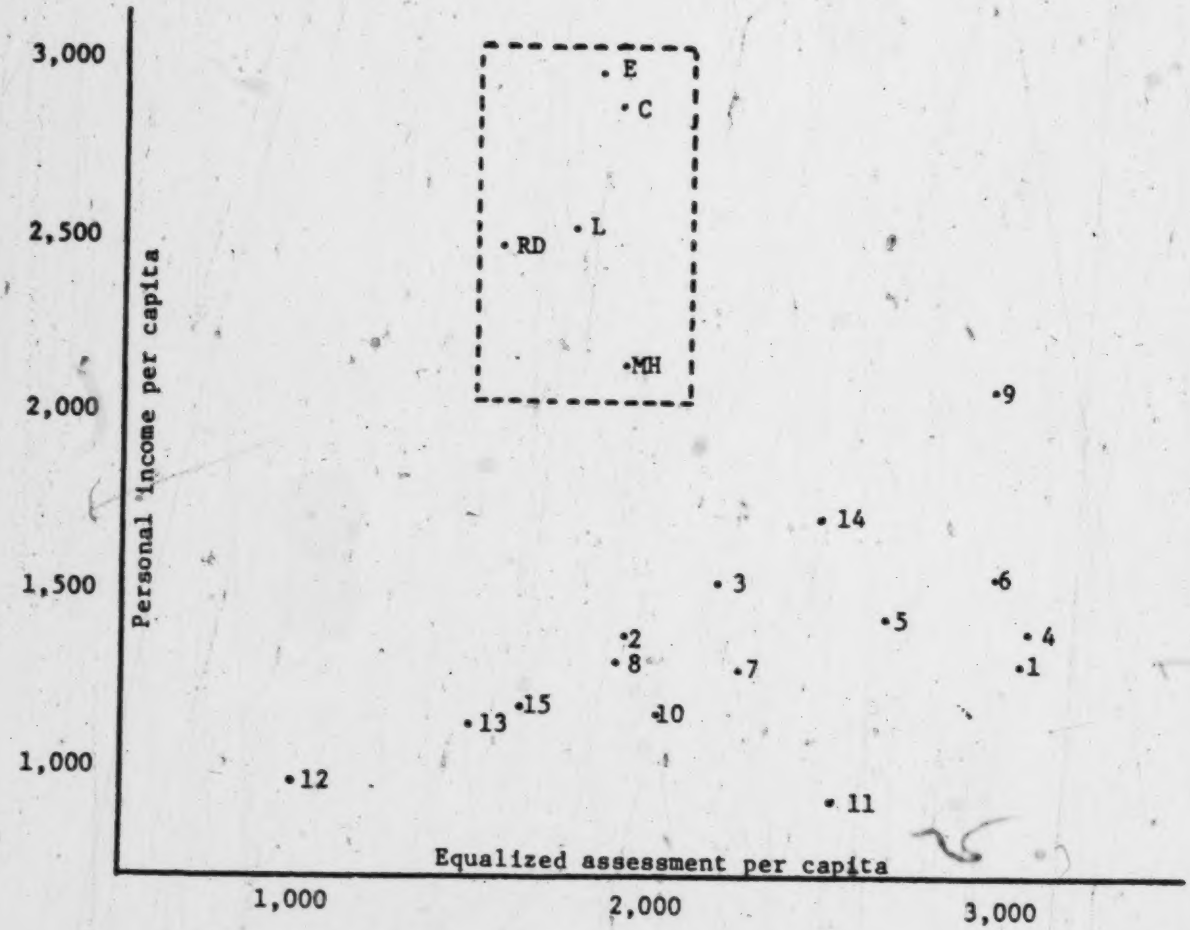

Figure 3: Equalized assessments per capita and personal income per capita by census division, Alberta 1969.

Legend: Numbers denote census divisions; E=Edmonton; C=Calgary; L=Lethbridge; RD=Red Deer; and MH=Medicine Hat.

the five cities. The results are shown in Table IV. Positive correlations were attained for both years. The coefficient was lower in 1969 than in 1966, and the dispersal of points on Figure 3 was greater.

TABLE IV

COEFFICIENTS OF CORRELATION BETWEEN TOTAL EQUALIZED ASSESSMENT PER CAPITA AND PERSONAL INCOME PER CAPITA IN THE CENSUS DIVISIONS OF ALBERTA, 1966 AND 1969, EXCLUDING THE FIVE MAJOR CITIES

	1966	1969
	r	r
Total equalized assessment per capita versus personal income per capita, Census divisions (N = 15)	0.751	0.524

Discussion

The positive correlations between equalized property assessments per capita and personal income per capita in the rural census divisions implied that property taxes were paid on the uniform tax levy in proportion to the collective income capacity of persons in these areas. Values of coefficients decreased from 0.751 in 1966 to 0.524 in 1969, which appeared to indicate a weakening of the relationship between the two years. One reason for this may have been the time elapsed since the previous major upward adjustment of equalized assessments which occurred in 1964 (Hanson, 1972, 45). Levels of personal income may have increased more rapidly in some census divisions than in others without a corresponding adjustment in property valuations. This tendency for property assessment to lag behind market values is one reason for the relative inelasticity of the property tax (Hanson, 1972, 57).

Another finding in this section was that the five major cities stood apart from the rural census divisions as areas of high personal income and average equalized property assessment. This finding indicated that taxes on the basic levy represented a smaller proportion of personal income in these cities as opposed to other areas in the Province: that is, the tax burden in the cities was relatively smaller. However, the finding could not be settled on the basis of the analysis presented here. The discrepancy may have arisen on account of the way net farm income was calculated. A block averaging plan for farmers was in effect throughout the period covered in this study which provided income tax relief to compensate for fluctuations in income (Salyzyn, 1971, 49-50). The possible consequence of this arrangement was to depress the level of reported personal income in the rural census divisions. The income averaging plan for farmers would provide for a lack of comparability of personal incomes in rural and urban areas. That is, the correlations between equalized assessments and personal income in rural areas are meaningful because the data on personal income are comparable. However, it may not be appropriate to conclude that the property tax burden between cities and rural census divisions was unequal when personal incomes in these areas were reported on a different basis.

Conclusions

Equalization of the tax burden, in terms of the proportion of personal income paid for basic school support, occurred in the census divisions of Alberta, not including the five major cities, under the Foundation Program. The tax burden appeared to be lower in Edmonton, Calgary, Red Deer, Lethbridge and Medicine Hat, the five major cities in the Province. However, it was speculated that the discrepancy between reported personal incomes in cities and rural areas may have been due to the manner of reporting net farm income.

EQUALIZATION IN GRANT APPORTIONMENT

The second part of this inquiry concerned the allocation of foundation grants to school systems and the following four questions were formulated:

I What was the pattern of distribution of foundation payments per weighted pupil in Alberta school systems in the years selected?

II What was the relative variation in foundation payment per weighted pupil over the years selected?

III Did school systems with high taxpaying ability receive more foundation funds per weighted pupil than districts of low ability for the years selected?

IV Which of the following factors, enrolment, taxpaying ability, tax effort, expenditure per pupil, average teacher salary and pupil-teacher ratio, were significant predictors of differences in foundation payment per weighted pupil among school systems for the years selected?

The results, discussion of findings and conclusions for each question are presented under the appropriately numbered headings.

I. Distribution of Foundation Payments per Weighted Pupil - Findings

Frequency distributions of foundation payments per weighted pupil to school systems for the years selected in this study are shown in Table V. The total number of school systems, the mean value for foundation payment per weighted pupil, and the proportion of systems in the

TABLE V

FREQUENCY DISTRIBUTIONS OF FOUNDATION PAYMENTS PER WEIGHTED PUPIL TO SCHOOL SYSTEMS IN ALBERTA IN SELECTED YEARS

$	1962	1964	1966	1968	1970	1971
675-699						
650-674						1*
625-649						
600-624						
575-599						
550-574						3*
525-549	1*					2*
500-524						11
475-499						39
450-474		1*			24	58
425-449			1*	1*	65	15
400-424				2*	31	2
375-399		2*		33	8	3
350-374	1*	1*	15	51	2	1
325-349	2*	1*	61	36	4	
300-324	1*	18	38	12		
275-299	3	75	15	1*		2*
250-274	12	33	6	1*	1*	1*
225-249	54	5	1*		2*	1*
200-224	71		1*	1*	2*	
175-199	6		1*	1*		
150-174	2*	3*	1*			
125-149						
100-124	1*					
TOTAL	154	139	140	139	139	138
Mean foundation payment per weighted pupil:						
	$230	$283	$320	$352	$422	$446
Proportion of systems in three intervals closest to the mean :						
	86%	91%	81%	86%	75%	62%

* Systems selected for further analysis

three intervals closest to the mean for each year, are given at the foot of the table. This table was constructed from the information in Appendix B, where the foundation payment per weighted pupil in each school system is given by year.

The distributions for all years in Table V show that the majority of school systems received foundation payments per weighted pupil close to the mean for all systems. Most of the school systems were placed within a range of fifty dollars from the mean value. The largest proportion of systems in the three intervals closest to the mean occurred in 1964. This tendency to cluster about the mean was not as strong in 1970 and 1971 as under the 1961-1969 foundation formula.

Also apparent from Table V is that a small number of school systems received foundation payments per weighted pupil far in excess of or far below the mean value.

Distribution of Foundation Payments per Weighted Pupil - Discussion

The pattern of distribution of foundation payments per weighted pupil showed a similar clustering about the mean value for each year selected in the study: the majority of school systems received payment within a range of fifty dollars from the mean. However, fiscal equalization in grant allocation, interpreted in this study as the same level of foundation payment per weighted pupil in all school districts, did not occur in any of the years. But it was not expected that this strict criterion would be met since the foundation formula was designed to provide for differences in program needs among school systems. The mean value of foundation payment per weighted pupil was simply used as a benchmark for the purpose of comparing the level of funding in different systems. In this respect, a small number of school systems was found to deviate greatly from the mean in each of the selected years. Further analysis was undertaken to identify some of the characteristics of these deviant systems. The systems chosen for analysis are marked with an asterisk in Table V.

Distribution of Foundation Payments per Weighted Pupil - Further Analysis

Tables VI through XI, based on the information in Appendix B, contain the foundation payment per weighted pupil, enrolment, equalized assessment per pupil, supplementary requisition mill rate, operational expenditure per pupil, average teacher salary and pupil-teacher ratio for school systems showing a marked deviation from the mean foundation payment per weighted pupil in each of the selected years.

1962. Descriptors for the five highest and three lowest systems on foundation payment per weighted pupil in 1962 are presented in Table VI. Mean values for all school systems are included in the table. Considerable deviation from the mean foundation payment per weighted pupil was evident for these systems. All of the school systems were small, or very small, according to the enrolment figures, and were situated in remote rural areas. A system's wealth, as shown by the equalized assessment per eligible pupil, did not appear to be related to the level of foundation payment. Berry Creek, the wealthiest system, received the highest per weighted pupil grant: but St. Isidore, with an equalized assessment per eligible pupil far below the mean, was also placed with the high grant recipients. The local tax effort, shown by the supplementary requisition mill rate, may have been responsible for the level of foundation funding in some cases. Two school systems in the high-grant group, Atlee and St. Isidore, had very high mill rates while two of the low-grant group had mill rates that were below average. However, the pattern did not hold for the other three systems in the high-grant group. Beaverlodge R.C.S. was one instance of a poor school district which made an above-average tax effort and still received a low

TABLE VI

DESCRIPTORS FOR FIVE HIGHEST AND THREE LOWEST SCHOOL SYSTEMS ON FOUNDATION PAYMENT PER WEIGHTED PUPIL IN 1962

*(Dollar figures rounded to the nearest dollar)

Number	School System	Foundation Payment per weighted pupil $	Enrolment	Equalized Assessment per eligible pupil $	Tax Effort mills	Operational Expenditure per pupil $	Average Teacher Salary $	Pupil-Teacher Ratio
10	Berry Creek S.D.	530	182	15,569	0.0	777	4,701	14.0
1441	Atlee S.D.	356	10	5,288	26.9	554	4,675	10.0
1500	St. Isidore S.D.	337	55	562	33.9	401	4,153	27.5
1470	Faraway S.D.	332	16	2,304	6.1	324	4,703	16.0
1580	Egremont S.D.	316	29	2,079	4.1	377	4,075	14.5
	Mean values for all school systems	230	2,056	3,683	7.9	326	4,960	22.6
1550	St. Bernadette R.C.S.	182	90	902	5.0	239	3,475	18.0
1110	Beaverlodge R.C.S.	172	86	1,428	10.0	257	3,617	28.7
1511	Judy Creek R.C.S.	154	20	3,423	1.9	310	3,550	20.0

S.Div. = School Division; S.D. = School District; R.C.S. =Roman Catholic Separate School District foundation grant per weighted pupil. On operational expenditure per pupil, generally, those systems with above-average foundation payment per weighted pupil had a high level of operational expenditure. The average teacher salary in high-grant systems was below the mean value for all school systems while two of the low-grant group had high salary levels. There did not seem to be much connection between average teacher salary and level of foundation funding except for the three lowest systems where the average teacher salary was well below the mean. Lastly, with pupil-teacher ratio, no relationship was evident although the pupil-teacher ratio in high-grant systems was generally lower than in the low-grant systems. In sum, systems which were at the extremities of the foundation payment per weighted pupil in 1962 had the following characteristics:

(i) All were small or very small rural school systems;

(ii) Some were very wealthy systems, and some were very poor;

(iii) Two systems with a very high local tax effort were among those in the high-grant group;

(iv) Operational expenditure per pupil was generally higher in the high-grant group;

(v) The three lowest systems had average teacher salaries well below the mean; and

(vi) The pupil-teacher ratio was generally lower in the high-grant systems.

There was no clear relationship between the position of a system on any of these descriptors and the level of foundation payment.

1964. Descriptors for the five highest and three lowest school districts on foundation payment per weighted pupil in 1964 are shown in Table VII. Three districts, Berry Creek, St. Isidore and Faraway, which were in the high-grant group in 1962, reappeared as extreme systems in

TABLE VII

DESCRIPTORS FOR FIVE HIGHEST AND THREE LOWEST SCHOOL SYSTEMS ON FOUNDATION PAYMENT PER WEIGHTED PUPIL IN 1964

*(Dollar figures rounded to the nearest dollar)

Number	School System	Foundation Grant per weighted pupil $	Enrolment	Equalized Assessment per eligible pupil $	Tax Effort mills	Operational Expenditure per pupil $	Average Teacher Salary $	Pupil-Teacher Ratio
10	Berry Creek S.D.	462	231	18,086	3.8	641	5,941	21.0
70	Sullivan Lake S.D.	396	418	11,338	7.9	533	5,977	19.9
1500	St. Isidore S.D.	378	56	754	8.4	356	4,280	28.0
1270	St. Rita R.C.S.	371	81	5,900	8.7	342	4,733	20.3
600	Edmonton S.D.	330	57,762	8,374	5.7	389	6,702	23.2
	Average values for all school systems	283	2,386	6,038	6.3	340	5,245	21.6
360	Northland S.D.	174	2,573	769	13.3	511	5,872	19.8
1480	Grovedale S.D.	169	100	551	13.0	247	5,582	25.0
1470	Faraway S.D.	115	16	3,877	10.0	133	4,750	16.0

S.Div. = School Division; S.D. = School District; R.C.S. = Roman Catholic Separate School District

1964. One of these, Faraway, shifted from the high to the low-grant group. Substantial differences in foundation payment per weighted pupil between the two groups was evident again in 1964. Six of the eight systems were below the enrolment mean. Three of the high-grant systems were relatively wealthy while all the low-grant systems were below the mean for equalized assessment per eligible pupil. In local tax effort, all of the low-grant group and three of the high-grant group had above-average supplementary mill rates. Operational expenditure per pupil was above the mean in all high-grant systems and well below the mean in two of the low-grant systems. Northland, which had a large proportion of Indian pupils, had a high level of operational expenditure. The level of average teacher salary and pupil-teacher ratio provided no basis for distinguishing between the two groups. To recapitulate, the deviant systems on foundation payment per weighted pupil in 1964 had some of the following features:

(i) Most of the school systems had small enrolments;

(ii) All systems except Edmonton Public, served rural areas;

(iii) Extremes in equalized assessment per eligible pupil were present; and

(iv) All the poor systems had above-average supplementary requisition rates.

In 1964, as in 1962, there was no clear connection between the position of a school system on any of the descriptors and the level of foundation funding.

1966. Descriptors for the highest and the four lowest school systems on foundation payment per weighted pupil for 1966 are given in Table VIII. Three of these districts, St. Isidore, Faraway and Northland, appeared in 1964 in the same positions relative to the mean. An

TABLE VIII

DESCRIPTORS FOR HIGHEST AND FOUR LOWEST SCHOOL SYSTEMS ON FOUNDATION PAYMENT PER WEIGHTED PUPIL IN 1966

*(Dollar figures rounded to the nearest dollar)

Number	School System	Foundation Payment per weighted pupil $	Enrolment	Equalized Assessment per eligible pupil $	Tax Effort mills	Operational Expenditure per pupil $	Average Teacher Salary $	Pupil-Teacher Ratio
1500	St. Isidore S.D.	429	50	902	14.0	505	4,101	12.5
	Average values for all school systems	320	2,594	5,311	8.4	398	5,839	20.5
240	Foothills S.Div.	241	2,943	6,038	6.5	303	4,813	21.5
1470	Faraway S.D.	223	10	6,784	15.0	322	5,041	10.0
360	Northland S.Div.	179	3,178	991	15.0	593	6,571	19.1
1440	Nordegg S.D.	152	12	0	0.0	662	6,200	12.0

S.Div. = School Division; S.D. = School District examination of the descriptors for 1966 provided no basis for discriminating between high and low-grant school systems. Three of the five systems had low enrolments and small pupil-teacher ratios. All of the school systems served remote rural communities.

1968. Descriptors for the three highest and four lowest school systems on foundation payment per weighted pupil in 1968 are shown in Table IX. Two of these systems, Faraway and Northland, appeared among the deviant districts in 1966, but Faraway shifted back to the high-grant group where it was in 1962. Except for Northland, all of the systems had enrolments below the mean, and three districts, Faraway, Lousana and Seebe, were very small. All the school systems served rural areas. As in 1966, the position of the systems on the other descriptor variables showed no marked distinction between the high and low-grant groups. For example, Acadia, a comparatively small wealthy system with an above-average supplementary requisition tax rate received less in foundation payment per weighted pupil than a slightly larger but less wealthy system, Paintearth Co., which had a smaller supplementary requisition tax rate.

1970. Descriptors for the five lowest systems on foundation payment per weighted pupil for 1970 are given in Table X. Some of these appeared in the low-grant group previously, Grovedale in 1964, Nordegg in 1966 and Northland in 1964, 1966 and 1968. All of the systems, except Northland, had very small enrolments, and all were below average on equalized assessment per eligible pupil. With the exception of Whitecourt, all the school systems served rural communities. No pattern was discernible on the remaining descriptors.

1971. Descriptors for the six highest and four lowest school

TABLE IX

DESCRIPTORS FOR THREE HIGHEST AND FOUR LOWEST SCHOOL SYSTEMS ON FOUNDATION PAYMENT PER WEIGHTED PUPIL IN 1968

*(Dollar figures rounded to the nearest dollar)

Number	School System	Foundation Payment per weighted pupil $	Enrolment	Equalized Assessment per eligible pupil $	Tax Effort mills	Operational Expenditure per pupil $	Average Teacher Salary $	Pupil-Teacher Ratio
540	Paintearth Co.	434	1,311	7,000	12.5	626	7,312	19.9
1200	Vermilion Co.	423	323	2,352	10.3	549	7,424	19.0
1470	Faraway S.D.	423	10	9,194	15.0	639	5,720	10.0
	Average values for all school systems	352	2,822	5,250	15.8	512	7,384	19.8
60	Acadia S.Div.	298	1,061	10,925	18.0	571	7,497	19.3
1330	Lousana Con.	273	70	6,626	2.0	373	5,584	23.3
360	Northland S.Div.	217	3,839	1,249	25.0	651	8,047	19.6
1450	Seebe S.D.	192	16	10,691	15.6	758	8,085	16.0

Co. = County; Con. = Consolidated School District; S.Div. = School Division; S.D. = School District

TABLE X

DESCRIPTORS FOR FIVE LOWEST SCHOOL SYSTEMS ON FOUNDATION PAYMENT PER WEIGHTED PUPIL IN 1970

*(Dollar figures rounded to the nearest dollar)

Number	School System	Foundation Payment per weighted pupil $	Enrolment	Equalized Assessment per eligible pupil $	Tax Effort mills	Operational Expenditure per pupil $	Average Teacher Salary $	Pupil-Teacher Ratio
	Average values for all school systems	422	2,977	5,534	12.4	622	8,778	19.8
1480	Grovedale S.D.	272	102	1,036	20.0	531	8,392	20.4
1440	Nordegg S.D.	239	55	1,417	15.7	920	11,266	27.5
360	Northland S.Div.	227	2,633	1,028	20.0	821	10,281	19.4
1180	Whitecourt R.C.S.	213	108	3,164	4.5	562	6,041	18.0
1010	Spirit River R.C.S.	220	70	1,463	10.0	447	7,007	23.3

S.Div. = School Division; S.D. = School District; R.C.S. = Roman Catholic Separate School District

TABLE XI

DESCRIPTORS FOR SIX HIGHEST AND FOUR LOWEST SCHOOL SYSTEMS ON FOUNDATION PAYMENT PER WEIGHTED PUPIL IN 1971

* (Dollar figures rounded to the nearest dollar)

Number	School System	Foundation Payment per weighted pupil $	Enrolment	Equalized Assessment per eligible pupil $	Tax Effort mills	Operational Expenditure per pupil $	Average Teacher Salary $	Pupil-Teacher Ratio
1140	Picture Butte S.D.	670	184	4,306	15.3	594	9,578	20.4
50	Lethbridge S.D.	560	3,257	6,096	15.5	716	10,366	18.6
1600	Sailsbury R.C.S.	554	1,220	2,192	12.3	553	10,688	25.5
1470	Faraway S.D.	550	9	10,412	17.3	686	10,640	9.0
1460	Waterton Park S.D.	538	22	51,864	3.0	1,052	8,197	11.0
1170	Grimshaw R.C.S.	532	207	3,059	14.3	585	9,876	20.7
	Mean values for all school systems	466	3,019	5,882	12.3	672	9,472	19.3
1440	Nordegg S.D.	297	105	2,631	9.8	780	10,455	26.3
360	Northland S.Div.	288	2,441	986	20.0	865	10,443	18.5
1010	Spirit River R.C.S.	261	69	2,006	12.3	530	7,598	23.0
1180	Whitecourt R.C.S.	247	116	3,048	4.4	501	7,114	19.3

S.Div. = School Division; S.D. = School District; R.C.S. = Roman Catholic Separate School District

systems on foundation payment per weighted pupil for 1971 are presented in Table XI. All districts in the low-grant group appeared in this position in 1970. Only Lethbridge, Sailsbury and Northland had high pupil enrolments. The six school systems of Faraway, Waterton Park, Grimshaw, Nordegg, Northland and Spirit River served rural communities. The four systems in the low-grant group were also below the mean on equalized assessment per eligible pupil. An examination of the positions of these school systems on the other descriptors revealed no systematic correspondence between supplementary requisition mill rates, operational expenditure per pupil, average teacher salary or pupil-teacher ratio, and the foundation payment per weighted pupil.

Distribution of Foundation Payment per Weighted Pupil - Discussion of Further Analysis

The purpose of analyzing the school systems at the extremities of the distributions of foundation payment per weighted pupil for the years selected in the study was to determine if these systems had any characteristics in common. Two principal characteristics appeared throughout the years, these being the size and location of the school systems: (1) most, but not all, of these systems had low pupil enrolments, and (2) the majority of these school systems served rural communities that were fairly remote in some cases. Otherwise, there was no clear relationship between the position of systems on the other descriptors, equalized assessment per eligible pupil, supplementary requisition mill rate, operational expenditure per pupil, average teacher salary or pupil-teacher ratio, and the level of foundation payment per weighted pupil in those systems. Nor did any district appear in this group of deviant systems every year. Faraway was among the high-grant systems in

1962, 1968 and 1971, and in the low-grant group in 1964 and 1966. Northland was in the low-grant group of systems from 1964 onwards. Some other systems also appeared more than once. These were St. Isidore in 1962, 1964 and 1966, Berry Creek in 1962 and 1964, Grovedale in 1962 and 1970, Nordegg in 1964, 1970 and 1971, Whitecourt in 1970 and 1971, and Spirit River in 1970 and 1971. The recurrance of these systems was consistent in that each system always reappeared in the high or low-grant group to which it belonged previously. However, the majority of school systems in the deviant group appeared only once: that is to say, it was not a particularly stable group.

Special circumstances, not evident from the descriptors examined here, may have been present which could explain the errant position of some school systems. Berry Creek, which was in the high-grant group in 1962 and 1964, received a contingency grant of $60,172 in 1961 (Alberta School Trustee, July-August 1961, 5). This grant assured Berry Creek of a high foundation payment per weighted pupil in 1962, 1963 and 1964, on account of the adjustment allowance in the formula for those years. Two other systems, Sullivan Lake and Edmonton Public, from the high-grant group in 1964, were also the recipients of substantial contingency grants in 1961 (Alberta School Trustee, July-August 1961, 5). The appearance of St. Isidore in the high-grant group in 1962, 1964 and 1966 was accompanied by an above-average supplementary requisition mill rate. St. Isidore, a school district in the Peace River country, served a small French-Canadian community that was determined to maintain their local school. Another system, Northland School Division, was established in 1960 to provide services for the small and dispersed largely Métis communities in Northern Alberta (Annual Report, 1961). How this designation could have led to Northland appearing in the low-grant group from 1964 onwards was not apparent. However, special circumstances associated with low enrolments and remote location, may have accounted for some small systems receiving a level of foundation grant well above or well below the mean. The unit of educational need used in the present study, the weighted pupil unit, may not have reflected the actual program needs in some of the smaller school systems.

In the analysis on equalization of the tax burden, it was found that the level of reported personal income was higher in the cities than it was in the rural areas and this suggested that the relative tax burden was lighter in the cities. Since equalization of the tax burden is a necessary prerequisite to fiscal equalization under a foundation program of school finance, it seems appropriate to examine what the consequences of the apparent urban-rural disparity in tax burdens may have been in terms of school system revenues. In the present analysis of the distribution of foundation payments per weighted pupil among school systems it was noted that no city districts, with the exception of Edmonton in 1964 and Lethbridge in 1971, appeared in the groups of systems at the extremities of the frequency distributions for the selected years. The position of Edmonton in 1964 could be attributed to the adjustment grant in the foundation formula, and the position of Lethbridge in 1971 could be attributed to its high supplementary requisition tax rate for that year. Therefore, it may be concluded that no systematic advantage accrued to city districts as opposed to other school systems through the operation of the finance formula. Initially, it might be supposed that city residents, because of the lower sacrifice in personal income required of them for basic school support, may have been willing to raise relatively more funds on the discretionary local levy than their rural counterparts. An examination of the data revealed that this was not the case. For example, city districts collected an average of $42 per pupil on supplementary requisitions in 1966 in comparison to an average of $44 per pupil for all school systems. Similarly, the average tax rate on supplementary requisition for city districts was 5.0 mills in 1966, while the average for all school systems was 8.4 mills. Thus, the apparent property tax advantage for cities under the Foundation Program did not result in a greater tax effort for school purposes in city school districts than in rural school systems.

One might ask, then, whether the disparity in tax burdens between city and rural school systems that was found in this study had any significance for fiscal equalization under the Foundation Program, or whether it was simply an artifact arising from the use of personal income as a measure of ability to pay taxes in both city and rural areas. Earlier, it was speculated that the manner of calculating net farm income tended to depress the level of personal income reported for income tax purposes. It may be appropriate to suggest further that the personal income of city taxpayers cannot be compared as a measure of wealth to the personal income of a taxpayer residing in a rural area, because the latter may receive income-in-kind that raises the value of his real income well above the dollar figure recorded on his income tax form. In other words, the correlations between equalized assessments and personal income in the rural census divisions are meaningful because of the comparibility of personal income across rural areas. However, the conclusion that the tax burden for school purposes under the Foundation

Program was not equalized between city and rural census divisions may not be valid on account of the non-equivalence of personal income in these areas.

Distribution of Foundation Payment per Weighted Pupil - Conclusions

The pattern of distribution of foundation payments per weighted pupil among the school systems in Alberta for the years selected in the study was typically leptokurtic with a strong clustering about the mean value in each year. This tendency was not as pronounced under the transitional Foundation Program in 1970 and 1971 as it was under the 1961-1969 formula.

A small number of school systems with foundation payments per weighted pupil well above or well below the mean value was identified for each of the selected years. The distinguishing features of these systems were that most of them served rural communities and had small pupil enrolments. It was speculated that circumstances attendant on low enrolments and remote location may have accounted for the level of foundation payment in these systems.

In addition, it was noted that the apparent disparity in the tax burden under the Foundation Program levy between school systems in city and rural census divisions did not result in a higher level of foundation payment per weighted pupil to, or a noticeably greater tax effort on supplementary requisition by the city districts. Therefore, the conclusion regarding the inequality of the tax burden between cities and rural areas was not established, since the disparity could have been attributed to the non-comparibility of reported personal income for residents in cities and rural areas.

II. Variation in Foundation Payment per Weighted Pupil - Findings

Coefficients of relative variation in foundation payment per weighted pupil are given in Table XII by year. The largest value of the coefficient 0.157 occurred in 1962. Values decreased in magnitude to 0.094 in 1968 and rose again to 0.105 for 1970 and 1971. The biggest change in relative variation took place between 1962 and 1964, and no change was recorded between 1970 and 1971.

Variation in Foundation Payment per Weighted Pupil - Discussion

The coefficient of relative variation was used in this study to measure the comparative variability in foundation payment per weighted pupil in different years. A decrease in the coefficient from one year to the next indicated that school systems were more alike in the second year on the amount of grant per weighted pupil received. This was the interpretation of equalization in grant apportionment under the univariate mode in this study. The degree of fiscal equalization in grant apportionment was lowest in 1962, and increased progressively in 1964 and 1966 until it attained its highest level in 1968. Thereafter, on the introduction of the transitional Foundation Program in 1970, the degree of equalization decreased somewhat and stayed at the 1970 level in 1971.

Variation in Foundation Payment per Weighted Pupil - Conclusions

When examined in the univariate mode, the extent of fiscal equalization under the Foundation Program was lowest in 1962. Between 1962 and 1968, the degree of fiscal equalization increased progressively. With the introduction of the transitional finance program in 1970, the degree of fiscal equalization decreased somewhat to about the 1966 level,

TABLE XII

COEFFICIENTS OF RELATIVE VARIATION FOR FOUNDATION PAYMENT PER WEIGHTED PUPIL BY YEAR

	1962	1964	1966	1968	1970	1971
Coefficient of Variation *	0.157	0.120	0.103	0.094	0.105	0.105

* Standard deviation divided by the mean

and held this position in 1971.

III. Neutrality of Grant Distribution - Findings

The gini coefficients for the degree of non-neutrality in foundation payment per weighted pupil are given in Table XIII. Positive values for the coefficient were recorded for each year in the study. The gini coefficient was smallest in 1962. The value increased to 0.017 in 1964 and remained almost the same level through 1968, with coefficients of 0.0177 in 1966 and 0.0175 in 1968. In 1970 the gini coefficient decreased to 0.0091, and in 1971 to 0.0044. The highest value of the coefficient occurred in 1966.

Neutrality of Grant Distribution - Discussion

Because all of the gini coefficients had positive values, the wealthier school systems, on aggregate, received higher foundation payments per weighted pupil than the less wealthy systems. However, the largest coefficient, that for 1966, had a value of 0.0177. This was considerably lower than the gini coefficient of 0.0792 for Louisiana in 1969 (Grubb, 1972); or the values of 0.0314 for unitary school districts,

TABLE XIII

EQUALIZATION IMPACT OF FOUNDATION PROGRAM

	1962	1964	1966	1968	1970	1971
Gini Coefficient *	0.0014	0.0173	0.0177	0.0175	0.0091	0.0044

* Zero values denote absolute equalization. Higher values of the gini coefficient denote lower degree of fiscal neutrality in the formula.

0.0513 for high school districts studied by Hickrod and Chaudhari (1973) for Illinois in 1969. The comparison was not strictly valid since these researchers were concerned with the distribution of combined state and local revenues on a per pupil, rather than a per weighted pupil basis. Nevertheless, high negative correlations between the fiscal ability of school districts and the amount of basic state aid per pupil were found for both Illinois and Louisiana in 1969 (Johns and Alexander, 1971, 182). These correlations indicated a high degree of equalization of school system revenue per pupil from state aid alone in the two states. Thus, while the Alberta Foundation Program directed a relatively larger share of foundation payments to the wealthier systems, the degree of non-neutrality in the distribution was probably arising from two of the more equitable finance formulas in the United States in 1969.

The values of the gini coefficients showed that the degree of non-neutrality in the distribution of foundation payments per weighted pupil was lowest in 1962, that it was relatively high and fairly constant from 1964 through 1968, and that it decreased again for both years of the transitional formula.

There was no correspondence between the pattern of fiscal equalization found in the univariate mode with the coefficient of variation and that found in the bivariate mode with the gini coefficient. Variability in foundation payment per weighted pupil was greatest in 1962 and the degree of non-neutrality in the distribution was least. Fiscal neutrality remained fairly constant from 1964 through 1968 when the relative variation in foundation payments per weighted pupil decreased. In 1970 and 1971, variability was constant while non-neutrality in the distribution of foundation payments per weighted pupil decreased. This lack of correspondence illustrated the distinction between the interpretation of fiscal equalization in the univariate and bivariate modes. Reduction of variability in the distribution of foundation payments per weighted pupil was not necessarily accompanied by a greater degree of fiscal neutrality. Considered together, the results of the two modes of analysis seemed to indicate that the variability of foundation payments per weighted pupil was not greatly influenced by the taxpaying abilities of school systems.

Neutrality of Grant Distribution - Conclusions

Under the Alberta Foundation Program in the years selected for this study, there was a tendency for wealthier school systems to receive relatively higher foundation payments per weighted pupil than systems with less fiscal ability. However, the departure from fiscal neutrality in the distribution was not very pronounced in any single year. The degree of non-neutrality in the distribution of foundation payments per weighted pupil was lowest in 1962 and relatively high and fairly constant from 1964 through 1968; it decreased progressively in 1970 and 1971. In the bivariate mode, therefore, the extent of fiscal equalization under the Foundation Program was greatest in 1962; and greater during the transitional finance program of 1970-1972 than for the years 1964 through 1968. A lack of correspondence between the results of the univariate and bivariate modes of assessing fiscal equalization suggested that school system ability to pay did not contribute in a significant way to the variation in foundation payments per weighted pupil.

IV. Factors Associated with Differences in Foundation Payments per Weighted Pupil - Findings

In applying the multivariate mode for assessing fiscal equalization under the Foundation Program, an attempt was made to examine the relationship between selected factors and foundation payments per weighted pupil to school boards. Six school system descriptors, enrolment, equalized assessment per pupil, supplementary requisition mill rate, operational expenditure per pupil, average teacher salary and pupil-teacher ratio, were entered as independent variables in an equation with foundation payment per weighted pupil as the dependent variable. A step-wise regression technique was used to determine the extent to which differences in foundation payments per weighted pupil could be accounted for by the six descriptors.

The results of the step-wise regression analysis for each year of the study are given in Table XIV. The number of school systems, the predictor variables in order of entry, associated F ratios and probability levels, and the proportion of total variance accounted for by the incoming variable, are displayed in the table.

Two variables emerged as significant predictors of foundation payment per weighted pupil in 1962, operational expenditure per pupil and

TABLE XIV

STEPWISE REGRESSION ANALYSIS: PREDICTORS OF FOUNDATION PAYMENT PER WEIGHTED PUPIL BY YEAR

Year	Number of school systems	Predictor variables in order of entry	F Ratio for variable entering	P	Proportion(%) of total variance accounted for
1962	153	Operational expenditure per pupil	135.7	0.000	47.3
		Supplementary requisition rate	5.8	0.017	2.0
1964	139	Operational expenditure per pupil	48.2	0.000	26.0
		Pupil-teacher ratio	19.3	0.000	9.2
1966	140	Average teacher salary	17.5	0.000	11.2
		Supplementary requisition rate	6.6	0.011	4.1
1968	139	Average teacher salary	10.3	0.002	7.0
1970	139	None			
1971	138	Equalized assessment per pupil	4.0	0.047	2.8

supplementary requisition mill rate. Of the percentage of total variance in foundation payments per weighted pupil, 49.3 percent was attributable to operational expenditure per pupil.

In 1964, operational expenditure per pupil again appeared as the most significant predictor of foundation payment per weighted pupil and it accounted for 26.0 percent of the total variance. The second most significant predictor, pupil-teacher ratio, accounted for the remainder of the 35.2 percent of total variance in that year.

Two descriptors appeared as significant predictors of foundation payment per weighted pupil in 1966. These were the average teacher salary and the supplementary requisition mill rate of school systems. Of the proportion of total variance in the dependent variable, 15.3 percent, over two-thirds, was attributable to average teacher salary.

In the remaining years, 1968 through 1971, only small portions of the total variance in foundation payments per weighted pupil were attributable to the emergent predictors. Average teacher salary accounted for 7.0 percent of total variance in 1968. No predictor emerged at the required level of significance in 1970. In 1971, the significant predictor, equalized assessment per pupil, accounted for only 2.8 percent of the total variance in foundation payments per weighted pupil.

Factors Associated with Differences in Foundation Payments per Weighted Pupil - Discussion

In the multivariate assessment of fiscal equalization under the Foundation Program, the fiscal ability of school systems did not appear to be an important predictor of foundation payment per weighted pupil in any of the years selected, with the exception of 1971. For that year, equalized assessment per pupil accounted for only 2.8 percent of the total variance in foundation payments per weighted pupil. This proportion was so low that it precluded any reliable prediction of the level of foundation payment per weighted pupil to a school system from a knowledge of the district's taxpaying ability. Therefore, it seemed appropriate to conclude that there was no consistent relationship between school system wealth and the size of foundation payments per weighted pupil under the Alberta Foundation Program in the years studied. This result supported the conclusion from the previous section that the degree of non-neutrality in the distribution of foundation payments per weighted pupil was quite small.

The most significant predictor of foundation payment per weighted pupil in 1962 and 1964 was the operational expenditure per pupil of school boards. This outcome could have been the result of the adjustment category in the foundation formula from 1962 to 1964 which provided an additional allowance for some school boards in order that they could maintain their 1961 level of expenditure per pupil without having recourse to supplementary requisitions. As a consequence, school systems with high per pupil expenditures in 1961 tended to have high foundation payments per weighted pupil in 1962 and 1964. In other words, the inclusion of the adjustment category in the formula seemed to have a disequalizing effect on foundation payments per weighted pupil to school systems.

In 1966 and 1968, average teacher salary of a school district appeared as the strongest predictor of foundation payment per weighted pupil. The relationship in this case was not as pronounced as it was for operational expenditure per pupil in 1962 and 1964 as indicated by the lower proportion of total variance accounted for by average teacher salary. Nevertheless, it suggested that school systems employing more highly qualified teachers tended to receive higher foundation payments per weighted pupil. The teacher grant in the foundation formula, with larger allowances for school boards employing the more qualified teachers, would have accounted for differences in foundation payments per weighted pupil attributable to the average teacher salary. However, the average teacher salary appeared as a discriminating factor in two years of the study only, whereas the teacher category was in the grant formula for each year from 1962 through 1968. This indicated that the teacher grant category was not as consistent a disequalizing factor in the Foundation Program as suggested by some writers (Atherton et al., 1969; Young, 1969; Hanson, 1971). The general shortage of teachers up to 1968 and the lack of qualified teachers in some subject areas may have moderated the extent to which school boards were able to take advantage of the teacher grant in the formula.

Two secondary predictors of foundation payment per weighted pupil emerged as being significant in 1962, 1964 and 1966. These were the supplementary requisition rate in 1962 and 1966, and the pupil-teacher ratio in 1964. To some extent, school systems making a high tax effort were enabled to receive relatively higher foundation payments per weighted pupil than systems with low tax effort in 1962 and 1966. Similarly, systems with high pupil-teacher ratios tended to receive larger foundation payments per weighted pupil. However, the relationships between the two variables and the dependent variable were not consistent over the years; and the proportion of total variance accounted for was not of sufficient magnitude to predict the level of foundation payment per weighted pupil in a school system from a knowledge of either variable.

Another outcome of the multivariate analysis was that the size of a school system as indicated by the enrolment did not appear as a significant predictor of foundation payment per weighted pupil in any of the years selected. The examination of school systems at the extremities of the distributions of foundation payments per weighted pupil in each year seemed to suggest that most of these systems had small enrolments. However, in the multivariate analysis, school district size did not seem to be related to differences in foundation payment per weighted pupil.

Factors Associated with Differences in Foundation Payments per Weighted Pupil - Conclusions

In the multivariate mode of assessing fiscal equalization, a school system's ability to support education as measured by the equalized assessment per pupil was not a significant predictor of foundation payments per weighted pupil in any year of the study, except in 1971 when a weak relationship existed. The most important factor accounting for differences in foundation payments per weighted pupil in 1962 and 1964 was the operational expenditure per pupil of school systems. This result was attributed to the adjustment allowance in the foundation formula from 1962 through 1964. In 1966 and 1968, average teacher salary appeared as the important factor leading to differences in foundation payments per weighted pupil among school districts. The teacher grant in the foundation formula was thought to account for the discrepancies in grant payments associated with average teacher salary. Secondary factors, supplementary requisition rate in 1962 and 1966, and pupil-teacher ratio in 1964, emerged as significant predictors of foundation payment per weighted pupil. However, the proportion of total variance in the dependent variable accounted for in each case was too small to place much confidence in the reliability of these predictors. Another outcome of the analysis was that differences in foundation payments per weighted pupil did not appear to be associated with the size of school districts.

General Conclusions on Equalization in Grant Apportionment

Absolute equalization in grant apportionment under the Foundation Program, in the sense that all school systems received the same dollar amount in foundation payments per weighted pupil, did not occur in any of the years selected for this study. However, it was not expected that this strict criterion would be met since the finance formula was designed to provide for differences in program needs among school systems. Examination of the frequency distributions of foundation payments per weighted pupil in each year revealed that gross deviation from the mean occurred in a small number of districts only. The greater proportion of school systems received foundation payments per weighted pupil within a range of $25 from the mean value. Therefore, the finance formula provided near fiscal equalization for the majority of school systems in each of the years selected.

Between 1962 and 1968, the relative variability in foundation payments per weighted pupil decreased continuously. This trend was accompanied by an increase in the degree of non-neutrality in the distribution of foundation payments per weighted pupil, which signified that a relatively higher share of the grant revenues accrued to the wealthier school systems. The general increase in the use of supplementary requisitions during that period could have accounted for the additional degree of non-neutrality in the distribution. With the introduction of the new finance formula in 1970, limitations were placed on the use of supplementary requisitions which increased the relative variability in foundation payments somewhat, but had the effect of decreasing the degree of non-neutrality in the distribution. The lack of correspondence, noted here, between the results of the univariate and bivariate analyses illustrates that fiscal equalization can be interpreted in different ways, and that a decrease in the variability in grant allocation does not necessarily denote an increase in the fiscal neutrality of the finance program.

The degree of fiscal non-neutrality in the Foundation Program did not appear to be very great in any of the years selected for this study. This conclusion was supported by the finding in the multivariate analysis that the fiscal ability of school systems was not related, in any predictable way, to the level of foundation payments per weighted pupil. Values of the gini coefficient were considerably lower for the Alberta Foundation Program than for two finance programs in the United States where a high degree of fiscal equalization existed. Therefore, although some degree of fiscal inequality is noted in the present study, it is possible that the Alberta Foundation Program achieved a high degree of equalization among school systems with different fiscal capacities in comparison to other foundation programs.

SUMMARY

Two major questions guided the analysis of data in the present chapter: (1) Did equalization of the school tax burden occur under the Foundation Program plan in Alberta between 1961 and 1971?; and (2) To what extent were grants under the Foundation Program distributed equally, in terms of the same dollar amount per weighted pupil unit, to school boards during the same period?

Relative to the first question, on the basis of an examination of the relationship between personal income and equalized property assessments in the census divisions for 1966 and 1969, it was concluded that equalization of the school tax burden under the Foundation Program occurred among the rural areas of the Province. Although there was an apparent disparity in tax burdens between city and rural census divisions, it was felt that a conclusion to this effect could not be made because the result was probably due to the non-comparability of reported personal income in cities and rural areas.

Equalization in the apportionment of Foundation Program grants was examined in the years 1962, 1964, 1966, 1968, 1970 and 1971. The frequency distributions of foundation payment per weighted pupil in each year showed a strong clustering about the mean, which indicated that for the majority of school systems equalization in grant apportionment occurred. However, there appeared to be a small number of school systems that received a level of foundation payments per weighted pupil well above or below the mean for each year. Special circumstances associated with small and remote rural districts were thought to account for the variation in grants to these school systems.

In the univariate mode, the variability in foundation payments per weighted pupil was examined for 1962, 1964, 1966, 1968, 1970 and 1971. The relative variation in foundation payments per weighted pupil was greatest in 1962; and, as interpreted in this section of the analysis, the degree of fiscal equalization was least in that year. Between 1962 and 1968, the degree of fiscal equalization increased progressively. With the introduction of the transitional finance program in 1970, the degree of fiscal equalization regressed to about the 1966 level, and held this position in 1971.

In the bivariate mode, the degree of fiscal neutrality in grant apportionment under the Foundation Program was assessed for the six years selected. The results showed that there was a tendency for wealthier school systems to receive relatively higher foundation payments per weighted pupil in each year than systems with less fiscal ability. However, the departure from fiscal neutrality was not pronounced in any single year. The degree of fiscal neutrality was greatest in 1962; and greater for the transitional finance program in 1970 and 1971 than for the years 1964 through 1968, when it was relatively constant. A lack of correspondence between the results of the univariate and bivariate modes of assessing fiscal equalization indicated that a reduction in the variability of foundation payments per weighted pupil was not accompanied by an increase in the degree of fiscal neutrality of the finance program.

The multivariate mode of assessing equalization in grant apportionment was concerned with the identification of factors accounting for differences in foundation payments per weighted pupil to school systems in the selected years. Fiscal ability of school systems did not appear to be a significant predictor of differences in foundation payments per weighted pupil, except in 1971 when a weak relationship existed. It was concluded that school system ability to pay was not an important determinant for grants paid under the Foundation Program between 1961 and 1971.

The most important factor associated with differences in foundation payments per weighted pupil in 1962 and 1964 was the operational expenditure per pupil in school systems, and this was attributed to the adjustment allowance in foundation formula for those years.

Average teacher salary appeared as a significant predictor of differences in foundation payments per weighted pupil in 1966 and 1968.

The teacher grant in the foundation formula could have accounted for this result. However, it was noted that the effect of the teacher grant was not as disequalizing as some authors seemed to think.

Some secondary factors also appeared as significant predictors of differences in foundation payments per weighted pupil among school systems in some of the years selected, but the proportion of total variance accounted for by these variables was too low to place much confidence in the reliability of these predictors.

A general conclusion on equalization in grant apportionment was that the aim of fiscal equalization of school board revenues was largely achieved for the majority of school systems under the Alberta Foundation Program between 1961 and 1971.

CHAPTER V

SUMMARY AND IMPLICATIONS OF STUDY

A summary of the study, implications for school finance in Alberta and some suggestions for further research are presented in this chapter.

Summary of Study

The purpose of this study was to examine the extent of fiscal equalization of school board revenues under the Alberta School Foundation Program. The study was based on the premise that fiscal equalization, a major objective of the school finance system in Alberta, was amenable to some form of measurement on a longitudinal as well as a cross-sectional basis. Two aspects of fiscal equalization were studied: (1) equalization of the tax burden for school support, and (2) equalization in the apportionment of grant funds. Data for selected years between 1961 and 1971 were collected from published sources and the eligible student count for all school systems under the Foundation Program was made available by the Alberta Department of Education.

Equalization of the tax burden was examined by comparing equalized property assessments per capita of school systems grouped by census division to personal income per capita in the census divisions in 1966 and 1969. Positive correlations were found for the relationship between property valuation and personal income in the non-urban division. This analysis indicated that, for these areas, and in the terms of the present study, equalization of the tax burden occurred since school taxes from the uniform levy under the Foundation Program were proportional to the level of personal income in school systems. However, when the five major cities of Alberta were included in the analysis, the correlations between property assessment and personal income were found to be low. Bivariate graphs revealed that the five cities stood apart from the non-urban census divisions as areas of high personal income and average equalized assessment. This finding suggested that taxes on the basic school levy represented a smaller portion of personal income in the cities than in the rural census divisions. The implication was that the tax burden for the foundation level of school support was relatively smaller in the cities of Alberta in 1966 and 1969. However, non-comparability of data on reported personal income was thought to account for the apparent disparity in tax burdens between cities and rural areas.

Equalization in grant apportionment meant, for the purpose of this study, a tendency towards equality in foundation payments per weighted pupil among school systems. Four sub-problems were contained in this portion of the study and the years 1962, 1964, 1966, 1968, 1970, 1971 were used in the analysis of each problem. The first problem concerned the distribution of foundation payments per weighted pupil among school systems in the years selected. Six frequency distributions were constructed and examined. The pattern of distribution of foundation payments per weighted pupil was found to be typically leptokurtic with a strong clustering about the mean value in each year. The tendency was not as pronounced under the transitional Foundation Program in 1970 and 1971 as it was under the 1961-1969 formula. A small number of school systems with foundation payments per weighted pupil well above or well below the mean value was identified for each of the selected years. These systems were examined in terms of the descriptor variables, enrolment, equalized assessment per pupil, supplementary requisition tax rate, operational expenditure per pupil, average teacher salary and pupil-teacher ratio. No consistent relationship between the foundation payment per weighted pupil of school systems and any of these descriptors was found. The distinguishing characteristic of these deviant systems, whether they were above the mean foundation payment per weighted pupil or below, was that most of them were small rural school systems.

The second sub-problem pertained to the variability in foundation payments per weighted pupil over time. Coefficients of relative variation in foundation payments per weighted pupil for each of the selected years were calculated and compared. The procedure was styled the univariate mode of assessing fiscal equalization and it provided for a longitudinal analysis of the Foundation Program in terms of one variable. As an outcome of the univariate analysis, it was found that the degree of fiscal equalization under the Foundation Program was lowest in 1962. Between 1962 and 1968, the degree of fiscal equalization increased progressively. With the introduction of the transitional finance program in 1970, the degree of fiscal equalization regressed somewhat to about the 1966 level, and held this position in 1971.

In the third sub-problem, the extent of fiscal neutrality, or distribution of foundation payments per weighted pupil, independently of school system wealth, was examined. The method employed was termed the bivariate mode of assessing fiscal equalization. Gini coefficients were calculated for each of the selected years and compared. The results showed that there was a tendency for wealthier school systems to receive relatively higher foundation payments per weighted pupil than systems with less fiscal ability in each year. However, the departure from fiscal neutrality in the distribution was not very pronounced in any single year. The degree of fiscal equalization in the bivariate mode was greatest in 1962; and greater for the transitional finance program in 1970 and 1971 than for the years 1964 through 1968, when it was relatively constant. A lack of correspondence between the results of the univariate and bivariate modes of assessing fiscal equalization indicated that two different aspects of fiscal equalization were being measured.

The fourth sub-problem was concerned with the extent to which school system enrolment, equalized assessment per pupil, supplementary requisition rate, operational expenditures per pupil, average teacher salary and pupil-teacher ratio accounted for differences in foundation payments per weighted pupil to school boards in each of the selected years. A multivariate mode of assessing fiscal equalization was used whereby the six descriptors were entered as independent variables in a stepwise regression analysis with foundation payment per weighted pupil as the dependent variable. The results indicated that equalized assessment per weighted pupil, or the fiscal ability of school districts, was not a significant predictor of foundation payments per weighted pupil in any year of the study except 1971, when a weak relationship existed. The most important factor accounting for differences in foundation payment per weighted pupil in 1962 and 1964 was the operational expenditure per pupil of school systems. This outcome was attributed to the adjustment allowance in the the foundation formula from 1962 through 1964 which enabled some school systems to maintain their 1961 level of per pupil expenditure without having recourse to supplementary requisitions. In 1966 and 1968, the average salary of teachers appeared as the important factor leading to differences in foundation payment per weighted pupil among school systems. The teacher grant in the foundation formula, where allowances were based on the level of professional preparation, was thought to account for the discrepancies in grant payments associated with the average teacher salary. Secondary factors, supplementary requisition rate in 1962 and 1966, and pupil-teacher ratio in 1964, emerged as significant predictors of foundation payment per weighted pupil; but the proportion of total variance in the dependent variable accounted for in each case was too small to place much confidence in the reliability of these predictors. Another outcome of the analysis was that school system size, as shown by enrolment, did not appear to be related to the level of foundation payment per weighted pupil in any of the years selected.

Implications for School Finance in Alberta

At the outset, it should be remembered that the present study is concerned with fiscal equalization under the Alberta Foundation Program. Fiscal equalization need not imply equality of educational opportunity. Equalization of education opportunities for students with different educational needs could result in instances of fiscal inequality. The concept of compensatory education recognizes that relatively more money would be spent on the education of children with intellectual, physical or social disadvantages. However, fiscal equality may be regarded as a first approximation to equality of educational opportunity. A finance program designed to achieve the goals of compensatory education must be based on a knowledge of the grant distribution required for fiscal equalization of school system revenues.

Equalization of school board revenues to a minimum or foundation level was a continuing objective of the Alberta School Foundation

Program Plan since its inception in 1961. Up to the present time, however, no studies were found in which an attempt was made to measure the degree of fiscal equalization achieved through the formula. A major contribution of the present study was the application of different statistical techniques for assessing fiscal equalization both on a cross-sectional and longitudinal basis. The criterion of equality adopted in the study was that the foundation payment per weighted pupil should be the same for all school boards. Use of this criterion made it possible to examine the distribution of foundation payments per weighted pupil in selected years from 1962 to 1971, to arrive at indices of the degree of equalization for each year, and to make comparisons across years. The approach used in this study was particularly relevant for analyzing the distribution of foundation grants since the Alberta Government changed the method of grant allocation to a per weighted pupil basis in 1973. Four techniques were used in the study to examine fiscal equalization. The first, which was relatively straightforward, was to examine the frequency distribution of foundation payments per weighted pupil in each of the selected years. Secondly, in the univariate mode, the variability in foundation payments per weighted pupil was compared for each year. Thirdly, in the bivariate mode, the fiscal neutrality of the grant distribution in different years was examined. Fourthly, in the multivariate mode, an attempt was made to identify some factors which would account for differences in foundation payments per weighted pupil among school systems in each of the selected years. Use of these techniques could provide the government with information on the performance of the Foundation Program with respect to the aim of fiscal equalization and would be useful in determining the consequences of various adjustments in the foundation formula in a simulation analysis. In addition, if the cost differentials of different types of educational programs, adult education or special classes for handicapped children, were incorporated into the Foundation Program on a weighted pupil basis as suggested by the Minister's Committee of School Finance (1972), the techniques used in this study could still be applied to examine the extent of fiscal equalization under the more complex formula that would be required.

Equalization of the tax burden for school support is fundamental to the equitable redistribution of funds under a foundation system of school finance. In this study, a significant positive relationship was found to exist between equalized property assessments per capita and personal income per capita in school districts situated in the non-urban census divisions in the Province. The conclusion was that equalization of the tax burden among these school districts occurred in 1966 and 1969. This conclusion bears a serious implication for school finance in Alberta. A recent policy statement indicated the government's intention of discontinuing the provincial levy for the School Foundation Program Fund. Enactment of the policy could mean that, at least in the rural areas, the tax burdens for school support might become less equitable. One consequence of such a policy would be to free local tax resources, and the government might encounter increased local pressure to raise the limits on supplementary requisitions. If increased use of supplementary requisitions is granted, basic differences in the fiscal capacities of school systems might ensure greater inequality in per pupil expenditures.

Another finding of the study was a lack of correspondence between the results obtained in the univariate and the bivariate analysis. Two different aspects of fiscal equalization were being examined. This was exemplified by the relatively large variance in foundation payments per weighted pupil in 1962 and the low level of non-neutrality in the distribution for the same year. The implication was that differences in foundation payments per weighted pupil were not necessarily related to the fiscal ability of school districts. Further evidence on this point was provided in the multivariate analysis where the equalized assessment per pupil of school districts was found to be a poor predictor of differences in foundation payment per weighted pupil in each of the selected years except 1971. For this reason, differences in the interpretation of fiscal equalization must be taken into account in examining school finance systems, for otherwise conclusions arising from the analysis could be both misleading and contradictory.

This study also bears some implications for the manner in which new grant categories are to be added to the foundation formula. The multivariate analysis in this study indicated that differences in foundation payment per weighted pupil were attributable to the adjustment allowance in the foundation formula from 1962 to 1964 which was geared to the current expenditure per pupil for school districts in 1961. On the other hand, the disequalization effect might not be so great if the new basis of allocation was an incentive grant similar to the teacher category in the 1961-1969 formula. The amount paid in a new grant category could be classified according to the level of funding required for the recipient program or project and an allowance scale could be introduced into the formula to regulate grant disbursement. Further, if the distribution of supplementary funds under the

Foundation Program depends on the ability of some school districts, because of a higher level of administrative expertise available to them, to win proportionately higher grants than other school districts, serious disequalization in foundation payments per weighted pupil to school boards could result.

Suggestions for Research

One impediment to extended research in school finance within a single province is the unavailability of personal income data for school systems. The approach used in this study was to group municipal districts by census division in order to match property assessments, income and population. No doubt, further work could be done in other provinces with this technique. It would be preferable, however, if the data were reported by district. Additional questions in the income tax forms asking for school system and municipal district numbers would provide the necessary data on personal income.

Two measures of wealth were compared in this study, equalized property assessments and personal income. Other criteria should be examined also, such as median family income, level of retail sales or the market value of property. Consideration of a number of measures would give further insight on the concept of school district ability to support education.

A major finding in the present study was the strong relationship between equalized assessments and personal disposable income, at least outside the five big cities. The conclusion drawn was that equalization of the tax burden for basic school support occurred in the non-urban census divisions. But this was a relativistic judgment which assumed the superiority of the personal income measure. Another approach would be to make an inter-rater reliability study of property valuations set by municipal assessors with the view to determining consistency in application of the guidelines set down in the assessment handbook. In this way, a rigorous test of the quality of equalization could be designed.

The apparent disparity between cities and rural areas in the tax burden for basic school support found in this study requires further examination. A random sample of city and rural residents could be compared on a number of variables related to taxpaying ability in order to study the incidence of school taxes.

This study introduces a number of methods of statistical analysis that could find wider application in research on school finance in Canada. The coefficient of variation could be used to test for a trend towards homogeneity among the provinces on various educational measures. Equalization effects of alternative finance programs could be examined with the three-way approach, univariate, bivariate and multivariate set out in this study. Also, a similar study of the Alberta Foundation Program, at a later date, or of grants-in-aid in different provinces might be considered.

In conclusion, the major purpose of education research is to improve the conditions under which learning takes place. The study of school finance deals with the allocation of resources for this purpose. It is hoped that this examination of the School Foundation Program in Alberta makes some contribution to knowledge in that field.

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APPENDIX A

SCHOOL DISTRICTS, DIVISIONS AND COUNTIES, ALBERTA 1961-1972

NOTE: S.Div.= School division; Co.= County; S.D.= School district; R.C.S.= Roman catholic separate school district; P.S.D.= Protestant separate school district; C.= Consolidated school district.

These initials denote the most recent designation of school jurisdiction. Former names are given in brackets.

Number Assigned in this Study	Administrative Unit	Number Assigned in this Study	Administrative Unit
10	Berry Creek S.Div.	200	Drumheller S.Div.
20	Cardston S.Div.	210	Wainwright S.Div.
30	Medicine Hat S.Div.	220	Provost S.Div.
40	Taber S.Div.	230	Westlock S.Div.
50	Lethbridge S.Div.	240	Foothills S.Div.
60	Acadia S.Div.	250	Calgary S.Div.
70	Sullivan Lake S.Div.	260	Bonnyville S.Div.
80	Peace River S.Div.	270	Spirit River S.Div.
90	Lac Ste Anne S.Div.	280	High Prairie S.Div.
100	Yellowhead (Edson) S.Div.	290	Leduc S.Div.
110	Rocky Mountain S.Div.	300	Fairview S.Div.
120	Neutral Hills S.Div.	310	Lac La Biche S.Div.
130	Lamont S.Div.	320	Fort Vermilion S.Div.
140	Minburn (Vegreville) S.Div.	330	East Smokey S.Div.
150	Flagstaff (Killam) S.Div.	340	Red Deer Valley S.Div.
160	Parkland (Stoney Plain) S.Div.	350	Three Hills S.Div.
170	Vermilion River S.Div.	360	Northland S.Div.
180	Willow Creek (McLeod) S.Div.	370	Grande Prairie Co.
190	Pincher Creek S.Div.	380	Vulcan Co.

APPENDIX A (continued)

390	Ponoka Co.
400	Newell Co.
410	Warner Co.
420	Stettler Co.
430	Thorhild Co.
440	Forty Mile Co.
450	Beaver Co.
460	Wetaskewin Co.
470	Barrhead Co.
480	Athabasca Co.
490	Smokey Lake Co.
500	Lacombe Co.
510	Sturgeon Co.
520	Wheatland Co.
530	Mountain View Co.
540	Castor Co.
550	St. Paul Co.
560	Strathcona Co.
570	Camrose Co.
580	Two Hills Co.
590	Red Deer Co.
600	Edmonton S.D.
610	Calgary S.D.
620	Lethbridge S.D.
630	Medicine Hat S.D.
640	Red Deer S.D.
650	Wetaskewin S.D.
660	Camrose S.D.
670	Grande Prairie S.D.
680	Drumheller S.D.
690	Calgary R.C.S.
700	Edmonton R.C.S.
710	Lethbridge R.C.S.
720	Wetaskewin R.C.S.
730	Red Deer R.C.S.
740	Medicine Hat R.C.S.
750	Drumheller R.C.S.
760	Grande Prairie R.C.S.
770	Camrose R.C.S.
780	Thibault S.D.
790	St. Albert S.D.
800	High River S.D.
810	Coleman S.D.
820	Stettler S.D.
830	Brooks S.D.
840	St. Paul S.D.
850	Redcliff S.D.
860	Bonnyville S.D.
870	Hanna S.D.
880	Bowness S.D.
881	West Jasper Place S.D.
882	Montgomery S.D.
890	Devon S.D.
900	Lodgepole S.D.
910	Swan Hills S.D.
920	Glen Avon P.S.D.
930	St. Albert P.S.D.
940	St. Martins (Vegreville) R.C.S.
950	St. Michaels (Pincher Creek) R.C.S.
960	Theresetta R.C.S.
970	McLennan R.C.S.
980	Wainwright R.C.S.
990	St. Johns (Fort) R.C.S.
1000	St. T. More (Fairview) R.C.S.
1010	Ste. Marie (Spirit River) R.C.S.
1020	Rosary (Manning) R.C.S.

Appendix A (continued)

1040	Peace River (Immaculate Conception) R.C.S.
1050	Jasper Place R.C.S.
1060	Taber R.C.S.
1070	High Prairie R.C.S.
1080	Cold Lake R.C.S.
1090	Provost R.C.S.
1100	Grande Centre R.C.S.
1110	Beaverlodge R.C.S.
1120	Bowness R.C.S.
1130	Coaldale R.C.S.
1140	Picture Butte R.C.S.
1150	Bow Island R.C.S.
1160	Valleyview R.C.S.
1170	Grimshaw R.C.S.
1180	Whitecourt R.C.S.
1190	Ponoka R.C.S.
1200	Vermilion R.C.S.
1210	Raymond R.C.S.
1220	Fort Saskatchewan R.C.S.
1230	Cochrane S.D.
1231	Westlock S.D.
1232	Drayton Valley S.D.
1240	Stirling S.D.
1241	Legal S.D.
1250	Turner Valley S.D.
1251	Pontmain R.C.S.
1260	St. Aubin R.C.S.
1270	St. Rita R.C.S.
1280	Killam R.C.S.
1290	Assumption R.C.S.
1300	Sexsmith R.C.S.
1310	Nampa R.C.S.
1320	Barons C.
1330	Lousana C.
1331	Great Bend C.
1332	Forestburg C.
1333	Forestburg C.
1340	Galahad C.
1350	Falher C.
1360	Crowsnest Pass C.
1390	Banff S.D.
1400	Canmore S.D.
1410	Lake Louise S.D.
1420	Exshaw S.D.
1430	Jasper S.D.
1440	Nordegg S.D.
1441	Atlee S.D.
1450	Seebe S.D.
1460	Waterton Park S.D.
1470	Faraway S.D.
1480	Grovedale S.D.
1490	Hays S.D.
1500	St. Isidore S.D.
1510	Burmis Camp S.D.
1511	Judy Creek S.D.
1520	Jubilee S.D.
1530	Fort Vermilion R.C.S.
1540	Clandonald R.C.S.
1550	St. Bernadette R.C.S.
1560	St. Laurent R.C.S.
1570	Breynat R.C.S.
1580	Egremont R.C.S.
1600	Sailsbury R.C.S.

APPENDIX B

DESCRIPTORS FOR SCHOOL DISTRICTS BY YEAR

School District Number	Enrolment	Equalized Assessment per pupil	Foundation payment per weighted pupil	Supplementary requisition rate	Operational expenditure per pupil	Average teacher Salary	Pupil-teacher Ratio
1962							
10	182.00	15568.54	529.17	0.0	777.07	4701.23	14.00
20	2900.00	3438.95	246.48	1.07	325.95	5470.62	21.97
30	1177.00	4610.00	291.38	6.00	398.32	4888.10	19.62
40	1777.00	3473.20	227.74	8.40	493.41	5109.89	13.99
50	3246.00	3330.19	218.71	8.52	323.16	5365.07	22.70
60	1022.00	5879.43	228.05	5.69	363.83	5004.68	19.28
70	552.00	5854.36	214.93	9.96	414.27	5206.80	18.40
80	2691.00	2809.99	222.11	8.09	303.67	4737.42	23.20
90	3011.00	2355.78	238.90	6.16	305.49	4675.17	24.88
100	3915.00	3075.22	216.65	8.00	307.65	5173.61	22.89
110	2146.00	1848.04	228.97	8.00	280.72	4784.52	22.59
120	816.00	4523.77	275.85	0.02	320.66	4741.92	20.92
130	2338.00	4192.19	217.30	4.02	291.01	5066.16	23.48
140	2426.00	4260.19	232.95	6.61	323.30	5331.44	21.86
150	2250.00	4351.67	227.16	1.23	284.74	4567.88	21.43
160	4081.00	3324.05	218.43	0.0	270.26	4771.73	22.67
170	2603.00	5349.76	230.26	3.77	312.64	4891.12	22.06
180	2662.00	5190.38	232.95	0.05	295.50	5050.51	23.56
190	1330.00	5612.83	228.22	4.50	367.01	4726.80	19.85

APPENDIX B (continued)

200	988,00	5442,42	232,27	8,05	339,65	5113.70	22,98
220	993,00	5468,18	204,51	8,00	319.19	5143.13	22,07
210	1974,00	4327,34	219,04	5,24	308,43	4855.70	21,46
230	2797,00	2828,84	223,58	5,54	324,58	5055.17	21,85
240	1436,00	6561.07	235,89	6,60	339,07	5341,83	21,76
250	2299,00	6314,22	233,57	4,09	367,63	5130,96	23,46
260	2528,00	1565,73	214,64	5,00	290,68	4864.64	21,98
270	1992,00	2798,98	233.31	9,65	311,60	4709,63	22,64
280	3036,00	1907,16	226,37	5,95	292,21	4800,92	24,10
290	3994,00	3725,20	231,69	7,50	338,28	5280,82	21,83
300	1468,00	3095,11	228,03	9,75	320,98	4605,22	21,59
310	1696,00	1155,44	221.54	4,74	270.37	5015,58	24,23
320	934,00	545,90	247,64	6,26	307.51	4845,21	24,58
330	964,00	1366,20	242,69	26,00	370.48	5225,57	22,95
340	482,00	1450,22	238,13	18,37	348,06	4988,74	20,96
350	2183,00	5334,50	232,32	8,00	349,01	5116.71	21,83
360	1431,00	707,58	231,52	15,00	481.08	4938,20	20,44
370	2732,00	3004,51	224,08	10,00	303,91	4750,05	23,15
380	1968,00	7293,02	233,51	8,22	367,63	4992.77	21,16
390	3427,00	3352,04	220,98	7,94	327,94	5500,53	23,47
400	1753,00	3500,60	257,08	20,08	403,89	4679,12	18,07
410	2345,00	4321,55	221,32	10,37	346,07	5246,33	21.51
420	1563,00	5092,54	242,15	8,89	330,99	4784,86	22.01
430	1730,00	3195,04	237,97	4,35	330,48	5267,88	22,47
440	1520,00	6586,98	251.57	3,00	357,15	4857,11	19,24
450	2377,00	3746,50	226,92	7,10	335,83	5140,16	20,14
460	2278,00	3813,58	229,52	9,77	325,85	5040,30	22,55
470	2398,00	2086,10	216,12	10,00	316,80	5316,39	24,98
480	2590,00	1932,45	217,36	3,01	287,83	4980,39	24,90
490	1667,00	2537,89	220,48	12,89	313,59	4683,68	19,85
500	3685,00	4398,66	242,87	12,03	363,43	5510,05	20,47
510	2630,00	3341,63	224,84	7,00	325,80	5063,81	21,56
520	1920,00	6247,18	219,37	10,45	369,79	4928,60	20,65
530	3861,00	3849,75	226,80	11,28	338,39	5344,45	23,40
540	1282,00	4735,05	244,33	7,83	352,34	4787,43	20,68

APPENDIX B (continued)

550	1998.00	2487.72	209.11	13.34	306.26	4955.94	23.51
560	4486.00	6392.91	249.69	12.10	390.00	5743.39	20.12
570	2030.00	3617.41	208.03	0.0	294.72	5227.18	23.07
580	2768.00	4083.31	241.63	2.04	371.28	4950.30	21.62
590	4236.00	3686.43	199.99	5.00	287.10	4864.94	23.27
600	49271.00	5358.35	227.66	7.44	326.11	5778.27	23.95
610	48807.00	7148.46	216.71	3.15	296.69	5635.16	26.13
620	6867.00	4665.39	221.85	6.83	316.75	5832.71	23.60
630	4895.00	4831.36	222.21	4.97	327.98	5922.96	22.98
640	4411.00	4015.88	268.81	3.13	280.28	5684.66	28.28
650	1285.00	3322.22	221.00	5.57	307.94	6040.55	24.71
660	1268.00	4335.88	213.76	5.13	287.76	5629.35	24.86
670	1895.00	3235.75	221.42	10.21	341.08	5096.18	21.53
680	1066.00	2106.84	205.52	0.0	300.65	5424.44	24.79
690	10437.00	3563.01	208.96	4.70	254.04	4856.05	28.59
700	15720.00	3861.16	219.05	7.45	285.45	4885.40	24.60
710	1723.00	4836.37	222.26	6.83	324.27	5628.31	24.27
720	174.00	2186.65	208.61	5.47	197.22	4054.00	34.80
730	756.00	2194.14	217.31	3.15	270.40	4980.63	25.20
740	1114.00	3365.74	233.91	5.50	308.23	4938.41	23.21
750	259.00	2342.31	213.43	0.0	258.97	4377.30	25.90
760	549.00	1838.55	204.00	10.21	259.98	4113.39	23.87
770	429.00	2645.55	230.66	5.00	303.22	4011.15	21.45
780	436.00	1558.43	217.12	0.0	272.12	5002.66	24.22
790	734.00	2432.89	247.80	10.53	341.05	5436.09	22.94
800	714.00	2782.11	207.44	0.0	254.50	5298.23	27.46
810	681.00	2680.61	208.19	0.0	253.49	4815.15	26.19
820	1185.00	2496.65	215.01	9.00	315.52	5168.48	21.94
830	939.00	2537.20	212.07	0.0	274.42	4876.33	24.08
840	1113.00	1646.61	215.81	0.0	306.77	5247.98	20.61
850	486.00	3781.12	207.33	4.74	282.57	5479.44	27.00
860	624.00	1964.13	212.80	0.0	285.83	4929.18	22.29
870	793.00	2694.71	244.81	6.69	290.32	5696.42	25.58
880	2392.00	2058.85	221.62	13.29	311.64	5359.75	24.16
881	6870.00	2875.29	236.10	17.57	332.85	6046.49	22.82

APPENDIX B (continued)

882	1350,00	2108,89	212,26	0,0	287,25	4941,84	24,55
890	483,00	2877,43	215,53	3,61	293,18	5904,10	25,42
900	208,00	3771,65	234,63	5,00	365,69	5837,25	26,00
910	169,00	2560,87	232,28	15,27	395,71	5308,38	21,12
920	402,00	1679,40	217,09	0,0	317,58	5545,42	21,16
930	498,00	3943,97	262,44	10,53	452,81	5172,27	17,17
940	242,00	3148,34	252,61	6,55	321,54	4329,66	20,17
950	335,00	1448,10	214,68	0,32	267,41	4456,80	22,33
960	188,00	1044,37	212,40	0,0	277,25	3924,37	23,50
970	297,00	980,26	218,19	6,00	291,38	4450,93	21,21
980	245,00	2186,17	253,08	6,28	337,36	4678,45	22,27
990	218,00	1009,91	214,77	15,00	293,58	4564,25	27,25
1000	249,00	1251,83	239,61	9,75	283,43	4201,61	19,15
1010	99,00	1479,19	213,51	9,50	281,98	5112,25	24,75
1020	211,00	787,59	226,08	8,00	279,14	4124,63	19,18
1040	236,00	1630,11	241,85	7,89	303,40	4355,00	21,45
1050	2199,00	2276,81	205,79	20,16	274,84	4168,02	23,39
1060	401,00	2179,46	228,87	8,40	348,41	5057,57	19,10
1070	349,00	1253,45	216,04	3,50	282,42	3721,19	21,81
1080	354,00	511,70	236,72	5,00	271,22	4219,80	23,60
1090	212,00	979,69	209,83	8,00	316,18	4745,60	21,20
1110	86,00	1428,29	171,89	10,00	256,55	3617,33	28,67
1120	358,00	1498,22	203,07	0,0	217,63	4047,29	25,57
1130	150,00	1016,49	261,31	8,51	395,73	4133,50	18,75
1140	162,00	1866,41	220,83	8,51	323,03	4239,66	18,00
1150	144,00	2111,56	257,82	3,00	312,01	4318,50	24,00
1160	164,00	320,22	198,00	26,00	220,73	3232,12	20,50
1170	141,00	1296,61	215,41	6,85	239,37	3222,43	20,14
1230	340,00	1140,26	208,01	0,0	322,37	4944,81	21,25
1240	194,00	3052,55	227,90	7,38	316,37	5258,66	21,56
1250	852,00	2403,74	227,92	8,00	325,80	5759,76	22,42
1251	92,00	1498,92	234,60	8,00	364,58	3473,80	18,40
1260	60,00	1724,48	220,09	4,62	243,62	5245,50	30,00
1270	78,00	3650,78	233,39	10,36	399,41	3666,75	19,50
1280	108,00	1961,44	223,85	1,21	292,39	4709,80	21,60

APPENDIX B (continued)

1290	100.00	1245.36	261.27	4.13	303.30	4469.60	20.00
1300	124.00	819.14	218.53	10.00	245.98	3543.50	20.67
1320	159.00	4985.72	246.97	17.23	411.53	5733.25	19.87
1330	90.00	3313.65	210.22	0.0	362.54	5298.66	30.00
1331	69.00	5186.32	272.83	0.0	285.45	4469.00	23.00
1332	355.00	3297.75	201.72	8.00	306.96	5189.00	22.19
1340	145.00	2784.16	212.68	21.70	321.68	6005.66	24.17
1350	419.00	1769.87	216.11	0.0	293.64	4857.66	23.28
1360	996.00	1997.45	208.82	14.22	314.94	5344.73	22.13
1390	596.00	15593.76	225.27	3.64	519.12	5773.73	22.92
1400	460.00	1832.92	235.85	18.50	282.44	5102.60	23.00
1410	23.00	55502.17	212.04	1.87	427.17	4623.00	23.00
1420	197.00	9140.39	267.79	15.78	465.30	6329.33	21.89
1430	504.00	8874.06	186.57	3.90	326.88	5293.33	24.00
1441	10.00	5288.36	356.09	26.85	554.10	4675.00	10.00
1450	31.00	5686.85	198.97	5.33	372.84	6756.00	31.00
1460	49.00	25699.02	284.67	0.0	505.92	4832.00	24.50
1470	16.00	2304.60	332.27	6.13	324.25	4703.00	16.00
1480	62.00	602.75	204.94	9.11	320.50	5533.50	31.00
1490	227.00	1750.36	205.52	1.16	293.70	4882.33	25.22
1500	55.00	561.72	336.97	173.94	401.18	7153.00	27.50
1511	20.00	3423.33	153.97	1.91	310.60	3550.00	20.00
1520	21.00	360.48	200.61	3.02	326.81	5507.00	21.00
1530	150.00	327.93	191.71	6.28	274.35	5234.16	25.00
1540	169.00	534.32	213.23	0.0	291.33	4511.57	24.14
1550	90.00	902.64	182.45	5.00	238.76	3475.40	18.00
1560	55.00	974.59	197.22	0.0	286.87	6561.00	27.50
1570	53.00	305.53	254.75	0.0	339.15	4567.33	17.67
1580	29.00	2078.57	315.97	4.10	376.90	4074.50	14.50
1964							
10	231.00	18085.60	462.03	3.78	641.09	5941.45	21.00
20	2782.00	6389.87	308.31	1.74	333.21	5858.38	22.62
30	1130.00	7394.52	319.09	4.94	466.93	4978.93	18.52

APPENDIX B (continued)

40	2883,00	5564,45	288,98	6,30	355,27	5236,05	20,74
50	3242,00	6145,57	287,93	6,62	356,94	5718,48	21,61
60	1063,00	9689,09	290,86	5,09	416,21	5170,41	18,02
70	418,00	11337,61	395,72	7,94	533,43	5977,71	19,90
80	2828,00	4527,73	271,98	2,49	310,61	5049,91	23,18
90	3195,00	4310,80	264,39	2,90	281,81	5210,20	26,19
100	4267,00	4774,80	276,09	4,78	308,87	5090,07	22,22
110	2273,00	2905,75	271,67	5,49	328,84	5088,71	21,24
120	859,00	7482,77	293,99	3,40	333,21	4855,80	20,95
130	2263,00	6815,52	288,54	5,00	331,22	5307,13	21,35
140	2404,00	6976,37	298,26	4,41	342,95	5509,17	21,27
150	2392,00	7206,23	314,23	4,92	338,87	5221,43	20,80
160	4012,00	6258,89	282,03	2,00	301,00	5308,64	21,92
170	2523,00	8986,21	289,23	5,02	334,24	5210,96	21,38
180	2722,00	8584,21	288,43	0,06	301,37	5245,60	22,31
190	1434,00	9579,10	293,89	1,50	338,21	5251,26	21,09
200	906,00	8942,48	276,74	7,30	346,36	4475,35	19,70
210	2063,00	6869,26	288,64	7,84	348,76	5650,96	21,27
220	990,00	8686,70	274,90	6,01	334,60	4738,02	18,68
230	2858,00	4543,09	280,38	8,03	328,21	5403,34	22,50
240	2283,00	7546,36	280,84	4,00	368,87	5767,36	22,17
250	2353,00	10788,62	290,70	3,06	333,76	5157,32	21,59
260	2532,00	2556,53	269,03	14,00	323,13	5257,41	21,10
270	2086,00	4055,88	271,40	7,44	352,45	4816,12	20,86
280	3178,00	3183,79	276,23	10,00	322,91	5056,95	23,03
290	4158,00	6492,66	291,28	8,05	364,21	5516,51	20,69
300	1539,00	5242,59	294,37	0,0	311,46	4877,88	22,97
310	1785,00	1794,30	266,26	0,0	275,48	5025,52	24,12
320	882,00	763,48	263,92	9,40	452,36	5734,43	25,20
330	1180,00	2143,97	255,46	18,89	393,88	5431,77	21,07
340	397,00	2799,58	258,89	11,00	361,40	4861,52	20,89
350	2211.00	8572,84	305,80	9,56	400,62	5430,83	20,28
360	2573,00	768,95	173,65	13,28	511.03	5872,45	19,79
370	2829,00	4853,78	286,57	9,00	343,00	4932,49	21,76
380	1959.00	11638,37	290.65	6.32	400.85	5189.38	19.79

APPENDIX B (continued)

390	3545,00	5519,64	294,09	9,03	352,65	5531.57	22,16
400	1791,00	5581,09	303,97	14,55	394,48	5007,89	18,28
410	2229.00	7046,78	288,65	4,08	390,58	5597,64	20,64
420	1434,00	7664,09	295,04	10,67	407,56	4994,73	18,87
430	1724,00	5223,77	292,70	4,06	330,38	5883,67	22,68
440	1499,00	10315,94	284.64	2,08	348,33	4889,95	19,47
450	2398,00	5885,43	284,49	10,02	351,54	5594,96	21,22
460	2410,00	5376,24	265,63	9,14	351.12	5100,15	20,78
470	2468,00	3076,79	289,18	11,61	316,54	5628,38	24,44
480	2596,00	3436,70	277,43	6,54	295,50	5437,43	24,96
490	1616,00	4166,89	279,98	8,26	335,37	5444,63	21.26
500	3832,00	6114,14	307.21	6,22	369,15	5591,30	20.60
510	2609,00	4212,05	294,22	12,55	359,98	5468,19	19.77
520	1948,00	9867,36	286,84	8.61	378,13	5093,99	19.68
530	3963,00	5924,97	290,44	9,00	355,71	5467,20	20.97
540	1255,00	7513,13	301.43	5,03	358,41	5008,24	20,24
550	2015.00	3709,90	278,19	9,19	342.37	5172.86	21,90
560	4823,00	11250,48	307,56	6,91	399,58	6153,88	19,85
570	2010.00	5966,05	281,99	0,0	323,43	5430,31	21,85
580	2837,00	6229,60	281,30	8,41	347,70	5228,02	20,56
590	4385.00	6763,99	289,55	1,00	320,15	5419,12	21,71
600	57762,00	8372,69	330,39	5,70	389,34	6702,02	23.20
610	57105,00	8503,53	291.27	3,48	335,14	5827,46	24,13
620	7143,00	7805,72	297,23	5,25	347,13	6058,50	23,19
630	5290,00	7713,98	304,89	6.00	366,45	6512,05	23.00
640	5407,00	6087,05	293,84	1,88	310,41	6242,73	26,00
650	1439,00	5379,61	299,54	2,67	347,67	6300,82	23.21
660	1432,00	7283,40	306,75	6,35	360,38	6615,27	23,87
670	2267,00	5549,05	293,99	11,22	359,38	5198,31	20,24
690	12940,00	6250,88	280,48	2,89	295,02	5132,18	25,73
700	20076.00	5508,69	305,65	5,91	339,86	5484,44	23.29
710	1897.00	7576,39	293,90	5,22	346,52	5639,62	23,42
720	170,00	5120,32	246,86	2,67	285,94	4233,75	21,25
730	980,00	3196,10	280,35	2,02	338,53	5350,15	20,85
740	1240.00	5717.57	285.95	5.89	324.53	4028.09	21.75

APPENDIX B (continued)

750	317.00	3676.52	271.34	0.0	266.48	4014.94	19.81
760	679.00	2769.11	271.40	10.94	345.01	4759.91	19.97
770	471.00	4144.64	276.72	6.40	327.46	4765.21	19.62
780	448.00	2718.20	285.10	0.0	290.33	5540.10	23.58
790	1021.00	4025.96	295.83	9.63	350.05	5672.04	21.72
820	1293.00	4273.98	298.30	11.26	369.38	5851.96	20.52
830	1038.00	4084.98	278.78	2.39	304.67	5051.86	21.18
840	1223.00	3037.44	281.46	6.75	323.77	5619.65	21.09
850	451.00	6434.17	261.71	4.27	314.22	5599.68	23.74
860	757.00	3424.85	274.57	9.59	302.80	5172.74	21.63
870	949.00	3693.82	268.85	3.38	300.56	5163.27	21.57
890	551.00	4726.21	293.17	6.13	345.58	6396.43	23.96
910	280.00	2664.50	232.71	16.96	369.42	4971.50	20.00
920	426.00	4137.56	281.44	6.75	329.99	5218.62	20.29
930	1329.00	4979.74	276.45	9.63	336.73	5484.48	22.91
940	295.00	4758.45	307.97	4.45	381.72	5147.20	19.67
950	374.00	2460.06	264.50	1.66	288.52	4783.83	20.78
960	196.00	1835.97	272.80	0.0	283.62	4508.78	21.78
970	333.00	1573.64	283.05	9.00	268.62	5148.15	25.62
980	265.00	2922.42	279.53	8.00	331.62	5171.23	20.38
990	287.00	1413.44	288.04	10.24	345.00	4626.23	22.08
1000	310.00	1809.89	293.67	0.0	293.57	5078.57	22.14
1010	113.00	1548.40	277.72	7.50	424.42	4810.16	18.83
1020	220.00	1102.87	273.40	2.49	338.77	5147.36	20.00
1040	289.00	2869.11	263.75	2.49	293.29	4226.86	20.64
1060	467.00	3658.29	285.67	8.40	341.93	5667.70	20.30
1070	346.00	1991.31	261.58	9.00	314.07	4939.27	23.07
1080	289.00	1835.82	243.56	14.01	304.79	4767.50	24.08
1090	208.00	1951.40	266.20	6.00	315.63	5780.00	23.11
1100	156.00	3052.96	233.00	14.55	261.74	3856.00	19.50
1110	119.00	1620.83	260.15	9.00	240.92	5545.50	29.75
1130	162.00	1726.75	262.31	7.46	353.90	5079.11	18.00
1140	186.00	3002.04	298.40	6.70	344.85	6006.78	20.67
1150	189.00	2701.64	280.06	4.00	289.75	5022.75	23.63
1160	269.00	606.80	275.88	18.00	305.22	4215.30	20.69

APPENDIX B (continued)

1170	185,00	2387,56	274,05	2,49	283,39	4293,00	23,12
1180	77,00	2950,62	231,62	2,89	297,26	5124,66	25,67
1190	191,00	2280,23	256,36	11,45	286.78	4983.75	23.88
1200	294,00	1853,98	269,77	5,20	282,01	5073,69	22,62
1210	106,00	2283,89	260,54	3,99	284,95	3968,33	17,67
1220	111,00	11812,54	257,49	8,54	406,24	4273.57	15,86
1240	196,00	4977,50	295,79	8,45	353,90	5835,44	21,78
1260	66,00	2146,91	257,41	0,0	283,12	4549,00	22,00
1270	81,00	5900,43	370,68	8,65	342,31	4733,00	20,25
1280	129,00	2820,97	286,13	4,50	254,95	5014,60	25.80
1290	113,00	1943,62	296,02	4,06	338,71	5071,80	22,60
1300	122,00	1396,46	255,62	9,00	267,94	3073,50	15,25
1310	61,00	1795,21	258,03	2,49	277.20	4873.33	20,33
1320	142,00	9898,20	249,45	7,60	397.54	5749,86	20,29
1330	69,00	7458,40	319,55	0,0	331,88	4620,00	23,00
1350	410,00	36164,01	287,01	0,0	303,53	4933,42	21,58
1390	636,00	20096,32	303,65	0,0	373,25	5978,64	22,71
1400	526,00	3752,41	283,52	4,43	360,47	5575,54	21,92
1410	20,00	61855,90	311,30	0,0	422,65	6393,00	20,00
1420	202,00	16334,81	307,85	9,15	433.73	6093,90	20.20
1430	551,00	11607,18	283,43	12,95	353,54	5226,71	19,68
1450	27,00	11390,85	300,44	8,63	382,93	6700,00	27,00
1460	38,00	34331,02	252,05	2,49	360,11	4575,50	19,00
1470	16,00	3877,00	115,37	9,99	133,06	4750,00	16,00
1480	100,00	550,53	169,08	13,00	247,84	5582,00	25,00
1500	56,00	754,04	377,58	8,39	355,61	6279,50	28,00
1510	14,00	1924,89	241,58	0.0	496,71	4420.00	14,00
1520	20,00	516,42	271,53	0.0	312.30	5093,00	20,00
1530	186,00	698,65	289,64	12,04	294,02	4548,78	20.67
1560	60,00	1225,84	278,12	0,0	233,97	5584,00	30,00
1600	343,00	2903,35	286,11	6,90	260,06	4494,43	24,50

APPENDIX B (continued)

1966

10	248,00	15899,69	272,97	14,72	560,63	6898,92	19,08
20	2879,00	6421,27	342,80	2,00	381,79	6578,39	23,03
30	981,00	10752,62	252,22	13,50	598,41	5921,62	16,91
40	3129,00	5353,68	333,88	9,90	409,85	6077,15	20,45
50	3167,00	5989,60	334,90	7,91	434,14	6490,25	19,67
60	1058,00	10102,80	319,75	10,53	456,01	6005,25	19,24
70	376,00	11983,82	338,01	13,88	526,99	5623,71	17,90
80	3039,00	4500,03	280,79	12,00	377,92	5710,11	20,82
90	3227,00	4592,16	300,30	4,50	352,56	5816,74	23,05
100	4536,00	4438,53	325,94	12,46	406,98	6322,47	20,43
110	2357,00	2913,99	314,18	8,00	365,69	5577,09	20,50
120	848,00	6997,98	296,01	12,00	387,65	5526,74	21,74
130	2105,00	6964,61	331,19	6,00	427,13	6400,64	20,05
140	2356,00	7015,40	343,66	8,07	430,33	6157,95	18,85
150	2423,00	5599,46	281,58	5,00	392,65	5653,87	19,54
160	4007,00	6641,61	309,54	2,00	358,25	5912,59	21,54
170	2518,00	7843,84	302,75	7,01	399,85	5618,05	20,14
180	2888,00	7850,84	324,45	2,00	365,74	5758,86	20,63
190	1424,00	9364,33	319,49	4,00	394,59	5786,66	19,24
200	882,00	8812,89	330,32	9,99	461,52	5795,32	22,05
210	2134,00	6425,75	330,62	6,00	391,04	5738,02	19,23
220	1009,00	9095,96	303,94	3,49	368,65	5751,24	20,59
230	2769,00	4281,40	307,65	10,00	404,23	5861,80	19,64
240	2943,00	6038,44	240,87	6,50	303,43	4813,37	21,48
250	2966,00	8806,55	325,21	5,90	390,86	6021,48	21,19
260	2480,00	2673,53	327,66	14,00	399,92	5771,50	19,37
270	2075,00	4033,79	302,22	13,39	395,61	5648,76	21,61
280	3362,00	3218,22	319,41	10,00	382,81	6069,87	22,12
290	4228,00	6543,62	331,77	8,50	429,47	6262,84	19,67
300	1590,00	5614,32	298,80	3,00	390,48	5638,63	21,49
310	1957,00	1701,54	303,88	15,00	416,80	5833,36	19,38
320	1177,00	971,93	288,68	15,00	458,32	5856,61	21,80
330	1342,00	2221,97	304,61	20,00	453,58	6030,04	20,65
340	1648.00	3496.79	301,66	7,83	420,01	6327,02	21,40

APPENDIX B (continued)

350	2148,00	8675,68	322,98	10,50	470,76	7185,70	21,92
360	3178,00	990,89	179,16	15,00	593,44	6571,18	19,14
370	2836,00	4788,54	328,70	15,00	427,18	6343,59	21,48
380	1990,00	10471,35	336,55	6,14	480,23	5602,91	18,43
390	3691,00	5413,80	345,52	8,00	422,10	6091,95	19,84
400	1756,00	4777,05	359,74	18,76	480,63	6077,07	19,51
410	2154,00	7000,88	336,19	11,52	467,20	6120,73	18,57
420	1403,00	10831,05	347,85	8,98	444,95	5621,76	19,76
430	1649,00	5918,27	336,17	7,50	399,96	6192,13	19,87
440	1486,00	9843,96	316,51	6,50	448,38	5562,93	18,35
450	2346,00	6332,50	338,18	9,41	443,99	6428,86	18,77
460	2354,00	6061,29	307,68	15,03	436,72	5608,98	17,97
470	2564,00	3925,55	328,91	8,58	380,16	6280,44	24,42
480	2518,00	3657,63	308,81	8,56	386,87	5704,89	20,98
490	1568,00	4305,00	318,98	9,88	411,32	6079,23	20,63
500	3760,00	6331,79	344,78	8,21	415,54	6192,81	19,79
510	2229,00	6898,92	340,63	12,79	476,80	6754,35	19,05
520	1943,00	10077,39	333,57	9,74	458,97	5532,82	18,50
530	4012,00	6291,91	339,80	9,50	440,88	6074,62	20,26
540	1269,00	7557,33	343,72	5,91	424,52	5729,77	19,52
550	1896,00	3873,27	339,29	11,69	427,11	6116,21	21,55
560	5384,00	11264,20	356,78	6,21	449,68	6500,95	19,37
570	1961,00	5928,25	330,29	1,75	386,91	6426,50	21,79
580	2697,00	6937,00	325,15	7,05	411,20	5998,62	20,13
590	4255,00	6922,56	335,56	5,50	416,74	6254,30	19,43
600	67128,00	7372,29	366,22	6,61	446,94	6940,90	21,61
610	65752,00	7798,16	354,08	5,74	433,93	6580,94	22,03
620	7291,00	6916,24	350,39	4,86	416,83	6581,62	21,76
630	5360,00	6995,89	364,89	4,97	462,25	6989,93	20,30
640	6268,00	5656,61	354,85	1,64	397,19	6912,30	22,79
650	1540,00	5250,15	365,63	5,25	467,25	6913,59	20,81
660	1588,00	7196,58	371,40	3,00	432,75	7089,66	21,46
670	2521,00	5575,49	359,82	11,03	454,96	5998,61	19,24
690	15959,00	4438,07	342,19	6,04	386,30	6254,15	23,64
700	25400,00	4502,80	340,81	6,65	379,60	5679,75	21,93

APPENDIX B (continued)

710	2048,00	6577,15	340,34	4,87	412,40	6096,54	22,51
720	204,00	4833,29	338,98	5,24	340,91	5280,20	20,40
730	1130,00	3544,06	331,83	3,87	351,54	6238,59	22.16
740	1462,00	4985,44	344,21	4,99	387,08	6116,26	21,19
750	292,00	3891,46	327,94	0,0	376,14	6254,92	22,46
760	760,00	2782,39	325,40	11,00	377,16	5707,21	20,00
770	494,00	4562,39	316,35	3,00	348,76	5410,32	19,76
780	441,00	3045,92	346,43	3,90	370,56	5273,33	18,37
790	1294,00	3453,55	339,18	5,59	408,75	6398,24	20,87
820	1285,00	4526,20	358,31	10,99	434,17	6547,97	19,47
830	1123,00	4109,23	336,82	5,31	408,11	5947,82	20,05
840	1386,00	2860,86	331,13	2,00	381,63	6281,26	20,38
850	489,00	6754,80	316,81	5,31	353,14	5868,35	24,45
860	854,00	3264,92	298,86	8,00	367,83	5669,68	19,41
870	966,00	3443,80	336,79	7,22	395,54	6286,00	20,12
890	578,00	4261,13	356,22	2,39	405,69	7618,72	23,12
910	332,00	2958,55	275,68	16,96	406,56	5103,16	17,47
920	497,00	3914,16	325,49	2,22	354,48	6212,21	21,61
930	1777,00	4792,14	355,59	5,35	408,77	5565,54	17,95
940	314,00	4922,82	336,36	8,07	428,15	5541,21	16,53
950	431,00	2351,53	351,45	3,89	354,64	5212,65	18,74
960	204,00	1627,29	336,86	5,47	323,67	5053,10	20,40
970	316,00	1585,20	314,20	9,00	336,46	5283,53	21,07
980	228,00	3340,68	292,68	6,00	360,85	4957,61	17,54
990	319,00	1560,26	303,58	34,96	347,96	5610,86	22,79
1000	349,00	1850,20	317,79	3,00	323,59	5638,63	21,81
1010	119,00	1860,95	306,61	20,00	362,38	5717,16	19,83
1020	194,00	1750,74	334,84	12,00	402,57	6096,90	19,40
1040	364,00	2745,06	316,25	12,00	372,00	5168,52	19,16
1060	499,00	3483,16	341,65	9,90	384,07	6184,17	21,70
1070	385,00	2117,04	304,56	9,34	309,02	5645,13	24,06
1080	262,00	1897,34	283,01	14,00	380,53	5074,92	20,15
1090	247,00	1974,77	305,70	3,50	340,45	5098,00	19,00
1100	158,00	3968,78	296,05	14,00	323,27	5219,86	22,57
1110	114,00	1645.66	295.76	15.00	348.54	4974.83	19,00

APPENDIX B (continued)

1130	153,00	1707,01	292,71	9,00	354,57	4576,50	19,13
1140	163,00	3838,94	295,35	7,99	353,67	6107,29	23,29
1150	219,00	2189,74	333,75	6,50	376,08	6005,27	19,91
1160	352,00	1195,25	320,24	19,01	367,64	5451,39	19,56
1170	204,00	2250,88	287,00	10,60	317,01	4897,10	20,40
1180	104,00	4052,24	272,49	4,50	206,82	2615,00	20,80
1190	218,00	2114,00	315,51	8,62	334,81	5525,40	21,80
1200	308,00	1734,66	318,82	8,86	350,38	6268,07	22,00
1210	118,00	1814,92	303,03	11,60	308,62	4526,50	19,67
1220	158,00	8103,69	342,17	8,47	434,80	5297,30	15,80
1231	237,00	2412,18	336,70	10,00	356,43	5822,16	19,75
1232	260,00	1219,34	304,60	2,00	346,72	4549,84	20,00
1240	191,00	5008,86	344,49	12,00	431,36	6920,89	21,22
1241	211,00	0,00	271,26	0,00	285,72	3951,15	16,23
1260	52,00	3013,04	342,02	8,00	354,15	6974,50	26,00
1270	94,00	5024,48	360,76	9,60	472,35	6463,75	23,50
1280	136,00	2650,60	317,11	5,00	341,59	5277,83	22,67
1290	122,00	1680,07	316,27	4,06	266,36	4330,00	24,40
1300	120,00	1529,80	304,76	15,00	338,13	5830,40	24,00
1310	73,00	1956,91	302,59	12,00	329,56	6069,00	24,33
1320	117,00	13535,30	264,52	2,23	389,21	5012,33	19,50
1330	71,00	6918,36	283,83	0,0	304,04	5071,66	23,67
1340	429,00	3441,70	322,47	3,00	330,55	5276,25	21,45
1360	1619,00	3748,38	325,81	7,19	385,34	5663,80	19,74
1390	647,00	19360,01	344,99	2,78	420,81	6678,86	22,31
1400	530,00	4162,03	336,43	12,25	426,58	6063,43	18,93
1420	211,00	16616,62	354,51	7,44	542,08	6285,00	19,18
1430	631,00	10904,76	335,68	7,74	395,49	5943,58	20,35
1440	12,00	0,00	152,08	0,00	662,00	6200,00	12,00
1450	23,00	14047,61	324,61	9,29	451,61	7000,00	23,00
1460	34,00	35535,14	294,78	2,73	452,79	5104,00	17,00
1470	10,00	6784,40	223,10	14,99	321,60	5041,00	10,00
1480	95,00	764,62	260,12	15,00	326,15	6526,00	23,75
1500	50,00	902,47	429,06	13.99	504.60	4101.75	12.50

APPENDIX B (continued)

1520	22,00	394,22	301,87	0,0	313,36	5321,00	22,00
1530	219,00	650,13	327,22	15,00	345,89	5395,70	21,90
1560	60,00	1159,65	335,10	4,99	332,35	4632,66	20,00
1600	464,00	2593,32	302,41	6,20	288,26	5453,23	27,29
1968							
10	258,00	15914,05	310,08	17,45	751,25	8868,07	18,43
20	2937,00	5891,74	301,45	5,94	495,62	8467,96	23.50
30	927,00	11481,52	353,34	23,00	774,16	7489,78	15,45
40	3138,00	5225,45	371,04	22,00	556,59	8253,09	19.61
50	3244,00	5427,87	366,91	17,86	553,79	8221,62	19,66
60	1061,00	10925,21	297,61	18,00	571,04	7496,87	19,29
70	327,00	13459,29	349,54	15,70	689,54	7730,37	17,21
80	3275,00	4511,10	310,32	23,54	468,31	7079,24	20,73
90	3424,00	4591,85	346,01	12,25	476,15	6778,73	19,68
100	4672,00	4461,03	361,79	23,54	533,26	8131,89	20,05
110	2451,00	2932,36	351,64	14,00	456,00	7384,08	20,95
120	878,00	7337,89	312,98	17,00	489,40	7349,65	20.42
130	1940,00	6591,49	369,47	17,38	546,14	8112,60	19,40
140	2367,00	6864,13	381,82	21,76	608,85	8163,87	18,07
150	2571,00	2229,15	377,93	47,16	568,84	7820,19	19,63
160	4260,00	6217,64	351,14	8,00	474,82	7730,57	21,96
170	2572,00	7667,70	344,53	10,20	506,10	6754,06	18.64
180	3106,00	7028,77	344,40	7,06	462,27	7399.37	21,27
190	1436,00	8370,91	374,54	13,02	579,54	7743,85	17,95
200	852,00	11249,64	354,01	11,60	518,38	7027,62	20,29
210	2208,00	5615,87	358,85	11,00	492,56	7487,66	19,37
220	1073,00	8407,25	332,14	8,75	471,58	6780,45	20,25
230	2763,00	4806,54	330,53	15,53	484,08	7512,00	20,77
240	3122,00	6297,18	348,54	7,01	479,51	8173,47	22,30
250	3318,00	9229,10	352,89	9,99	514,45	7387,38	20,36
260	2672,00	2650,97	350,28	19,97	486,48	7312,04	20,09

APPENDIX B (continued)

270	2093,00	4388,78	324,91	22,09	511,94	7533,34	20,93
280	3479,00	3097,89	346,66	20,00	488,65	7619,24	21,74
290	4468,00	5756,02	360,69	15,00	520,82	7889,04	20,22
300	1595,00	5291,70	325,48	12,50	443,39	7166,48	22,15
310	2161,00	1644,47	325,43	20,00	508,02	7389,00	19,47
320	1510,00	1324,74	237,56	23,00	624,89	7699,51	19,36
330	1500,00	2364,63	322,30	23,00	588,98	7674,77	19,23
340	1746,00	4156,83	332,65	16,69	555,93	7650,58	19,84
350	2147,00	8837,18	371,21	16,50	562,27	8036,43	19,00
360	3839,00	1249,11	216,93	25,00	651,14	8047,80	19,59
370	2876,00	4586,50	350,48	23,00	531,78	7075,85	19,30
380	1949,00	10041,46	357,74	14,54	607,75	7058,02	17,56
390	3826,00	5038,94	376,29	17,50	539,61	7399,96	18,85
400	1791,00	4611,57	368,65	19,70	543,34	7504,78	18,85
410	2117,00	6430,25	374,95	17,00	565,07	7792,70	18,90
420	1337,00	10964,75	397,69	11,09	536,78	7405,43	19,96
430	1701,00	5165,91	373,20	14,01	509,47	7786,88	20,01
440	1492,00	9286,63	328,33	19,00	581,85	7348,06	17,55
450	2313,00	6080,26	360,73	18,03	569,97	7865,77	18,80
460	2328,00	5688,75	331,20	21,16	541,00	6972,94	18,33
470	2446,00	3793,04	341,31	14,31	469,47	7525,85	22,44
480	2580,00	3473,14	354,02	24,00	507,32	6855,47	18,83
490	1465,00	4305,84	362,13	19,99	534,76	7622,31	18,31
500	3804,00	6066,55	376,59	14,68	550,18	7629,65	18,56
510	1908,00	7247,27	379,32	21,06	596,85	7978,86	18,17
520	1950,00	9513,17	363,86	15,26	649,79	7594,25	18,57
530	4252,00	6189,23	386,53	15,80	590,14	7897,20	20,06
540	1311,00	7000,87	434,12	12,53	626,24	7312,45	19,86
550	1844,00	3694,12	358,45	21,34	547,80	8073,87	20,26
560	6136,00	9829,86	386,89	11,00	553,10	8414,70	19,99
570	1818,00	5894,85	370,82	10,50	504,34	8060,51	20,20
580	2658,00	6627,26	342,98	18,22	510,00	7378,04	20,60
590	4322,00	6658,11	372,06	16,35	544,23	7581,56	18,16
600	71373,00	6981,65	395,35	15,89	573,56	8700,38	20,63

APPENDIX B (continued)

610	72007,00	7131,81	388,81	15,58	583,13	8211,18	20,93
620	7367,00	6443,85	378,35	13,35	517,77	8293,21	21,17
630	5379,00	6607,47	391,32	15,89	625,17	8976,77	19,35
640	6327,00	5261,32	390,95	13,18	583,40	8782,23	20,61
650	1555,00	4927,42	396,60	9,71	557,08	8446,28	19,68
660	1762,00	6467,95	393,89	5,50	555,74	8793,47	21,23
670	2685,00	4991,43	389,23	13,73	555,38	8219,36	19,32
690	18524,00	4763,14	369,43	13,26	484,09	7964,92	21,64
700	28876,00	4185,57	379,48	15,89	503,99	7792,69	21,08
710	2141,00	6248,35	377,87	12,43	531,23	8118,37	20,99
720	194,00	4315,24	373,98	9,71	459,22	6742,30	19,40
730	1261,00	3323,51	359,68	13,24	443,33	8194,57	24,25
740	1685,00	4347,83	375,56	16,01	516,51	8121,55	20,55
750	292,00	4735,80	355,79	20,44	456,58	8558,45	26,55
760	850,00	2943,85	347,01	11,88	502,44	7607,51	19,77
770	498,00	4952,66	335,10	5,47	395,91	5944,87	21,65
780	497,00	2675,45	391,24	18,86	550,34	7251,46	16,57
790	1500,00	3280,39	376,21	24,61	535,38	7981,71	19,48
820	1420,00	3769,42	380,57	17,47	570,42	8025,42	19,19
830	1223,00	3929,28	373,74	25,50	561,34	7912,68	17,99
840	1428,00	2577,14	361,40	9,00	474,03	7586.40	20,40
850	552,00	5417,90	331,70	14,09	428,00	7258,82	24,00
860	916,00	3151,64	351,67	13,00	516,89	7021.30	17,28
870	948,00	2975,30	355,05	12,68	509,55	7881,81	19,75
890	599,00	3840,96	388,40	14,25	504,41	9672,11	23,04
910	286,00	4016,95	311,37	20,00	559,05	6996,53	16,82
920	575,00	3136,40	353,05	8,26	456,95	7413,96	20,54
930	2096,00	3998,96	386,29	24,61	545,47	7371,79	17,04
940	248,00	7418,40	359,44	22,32	530,71	6986,07	17,71
950	501,00	2201,62	365,68	13,02	474,77	7201,92	20,04
960	211,00	1457,63	342,82	4,36	420,91	6195,73	19,18
970	264,00	2467,05	372,25	9,00	454,29	6853,38	20,31
980	197,00	3427,07	345,19	10,00	411,22	6405,20	19,70
990	523,00	1937,59	343,70	17,45	446,31	6159,72	20,92

APPENDIX B (continued)

1000	383,00	1945,70	323,49	12,50	450,82	6846,68	20,16
1010	94,00	2719,68	351,01	22,08	463,28	6840,60	18,80
1020	197,00	2145,57	361,77	23,00	440,99	6593,30	19,70
1040	407,00	3005,65	342,72	23,54	454,06	6474,00	19,38
1060	544,00	3210,78	363,18	22,00	518,22	8033,11	20,15
1070	417,00	2794,95	334,04	17,00	397,16	5773,35	20,85
1080	294,00	1871,30	324,53	20,00	407,39	6625,46	22,62
1090	260,00	1869,48	352,10	9,00	468,14	7198,79	18.57
1100	190,00	3103,91	325,23	14,00	407,78	5880,50	19,00
1110	114,00	1688,05	330,94	23,00	435,26	7457,00	22,80
1130	164,00	1489,51	328,79	19,90	521,79	7267,22	18,22
1140	174,00	3344,62	344,90	17,87	478,45	6217,10	17,40
1150	245,00	2118,82	378,4[illegible]	19,00	518,15	8512,16	20,42
1160	383,00	1413,04	350,13	23,00	602,51	7778,42	20,16
1170	242,00	1902,94	360,87	23,54	488,17	7091,15	18,62
1180	101,00	4443,66	332,96	12,50	378,04	4452,50	16,83
1190	234,00	2470,63	351,22	18,93	453,80	7704,30	23,40
1200	323,00	2352,44	423,49	10,25	549,00	7423,82	19,00
1210	113,00	1497,40	340,82	17,92	369,31	5194,66	18,83
1220	232,00	6822,69	352,68	9,73	406,45	6385,73	21,09
1231	271,00	2119,82	348,96	15,50	451,66	6443,46	18,07
1232	316,00	1203,21	387,58	8,00	401,10	6718,07	21,07
1240	216,00	3854,26	362,87	16,73	461.57	7909,30	21,60
1241	386,00	1874,10	357,82	12,50	553,02	7358,38	16,08
1270	120,00	4519,02	378,81	15,20	463,96	7104,16	20,00
1280	144,00	2846,42	354,66	14,90	421,78	7744,66	24,00
1290	130,00	1636,76	351,78	4,06	457,45	7251,00	21,67
1300	109,00	1377,75	324,52	23,00	457,83	7408,60	21,80
1310	98,00	1509,89	332,59	23,54	376,33	5547,60	19.60
1320	110,00	13468,45	317,38	15,94	447,42	6691,00	22,00
1330	70,00	6626,08	272,85	2,00	373,23	5584,33	23,33
1340	494,00	3068,95	335,57	10,00	470,36	7816,86	23,52
1360	1582,00	3480,10	348,76	16,39	479,32	7342,39	20,03
1390	671,00	17135,99	383,84	4.86	504,60	8033,83	22,37

APPENDIX B (continued)

1400	549,00	3993,52	356,98	27,12	496,84	7382,70	20,33
1420	223,00	15447,96	380,25	11,52	585,76	8834,30	22.30
1430	672,00	10405,58	376,99	10,48	579,18	7813,14	19,76
1450	16,00	10691,00	192,43	15,59	757,50	8085,00	16,00
1460	37,00	34813,95	319,71	2,55	506,76	6103,00	18,50
1470	10,00	9193,80	423,30	15,00	638,50	5720,00	10,00
1480	88,00	841,77	323,86	21,99	496,11	5977,80	17,60
1500	37,00	1193,32	345,17	43,81	577,49	5756,33	12,33
1530	186,00	783,76	376,53	22,99	497,25	7609,90	18,60
1560	59,00	1163,28	311,43	10,92	419,69	6536,66	19,67
1600	647,00	2003,14	371,05	11,00	490,75	7601,93	20,87
1970							
10	253,00	15552,67	339,08	19,59	878,09	9782.66	16.87
20	2877,00	5465,79	331,68	7,92	616,86	10462.39	22,83
30	847,00	15281,80	385,43	23,46	885,57	8706,40	15,40
40	3094,00	5046,82	441,18	17,93	670,38	9159,62	19,46
50	3272,00	5052,93	442,00	15,26	659,35	9682,05	19,02
60	1047,00	9709,54	410,28	12,00	699,65	8631,34	18,05
70	305,00	14569,18	398,74	15,92	840,29	8740,10	16,05
80	3284,00	5615,05	424,03	14,27	613,39	8455,94	19,32
90	3661,00	2615,13	440,80	8,13	593,26	8243,64	18,68
100	4913,00	4180,16	450,51	17,43	615,36	9204,56	19,81
110	2655,00	2908,68	444,67	6,28	568,25	9077,44	21,94
120	852,00	7319,78	434,58	14,73	646,08	8922,78	18,93
130	1876,00	6370,16	441,54	13,36	646,57	9315,20	19,34
140	2308,00	6597,71	430,47	15,81	741,20	9516,75	17,62
150	2656,00	6297,11	453,09	14,27	672.16	8966,05	18,84
160	5102,00	5371,95	453,67	7,50	592,93	8842,36	20,57
170	2528,00	7436,70	431,56	5,98	590,49	8285,96	18,59
180	3150,00	6735,56	405,55	8,06	634,20	8810.23	18,21
190	1488,00	8780,01	436,40	9,48	679,74	9256,14	17,93
200	755,00	11912,81	436,17	4,99	652,43	8564,57	18,88
210	2222,00	5388.64	427.86	9.80	619,13	8887,93	18,21

APPENDIX B (continued)

220	1092,00	8366,61	433,31	7,41	600,19	7853,45	19,16
230	2819,00	4732,93	430,87	8,72	601,65	9228,87	21,36
240	3251,00	6640,37	450,91	7,11	640,41	9196,52	19,01
250	3833,00	9023,43	439,97	8,40	654,81	8862,43	18,88
260	2702,00	2534,82	418,31	8,00	571,10	8369,91	20,16
270	2084,00	4672,94	425,91	10,00	631,27	8728,94	20,43
280	3752,00	3144,89	447,44	6,40	608,74	8967,07	19,75
290	4636,00	5229,72	444,79	10,32	633,99	8962,75	18,69
300	1599,00	5222,46	424,23	10,20	597,19	8337,61	20,24
310	2263,00	1917,57	421,65	14,00	622,79	9574,12	20,21
320	1730,00	1918,36	339,96	20,00	683,77	9336,02	20,35
330	1669,00	2690,83	404,33	19,00	585,84	8425,65	20,60
340	1809,00	4265,71	384,37	10,75	682,23	9550,64	19,88
350	2180,00	8366,18	445,69	11,95	654,27	8957,84	18,32
360	2633,00	1028,24	226,69	20,00	820,81	10281,11	19,36
370	2844,00	4436,29	420,72	17,01	614,89	8317,80	18,71
380	1894,00	9910,71	456,86	9,25	662,89	8853,12	19,33
390	3822,00	4774,43	446,82	16,50	674,11	9108,62	18,11
400	1716,00	6393,68	449,83	12,81	658,70	8282,95	17,51
410	2176,00	5731,59	447,40	14,63	653,11	9257,12	18,76
420	1217,00	12041,72	452,02	13,10	642,74	8140,70	19,32
430	1675,00	4982,09	442,95	14,68	685,37	9445,67	19,71
440	1487,00	8407,79	420,08	14,00	688,39	9098,07	17,92
450	2353,00	6289,35	446,34	14,17	687,53	9424,80	18,98
460	2367,00	5388,64	436,10	17,39	642,82	8976,21	19,72
470	2473,00	3701,38	432,55	5,30	596,52	8684,56	21,32
480	2639,00	3400,70	431,61	19,03	649,91	8613,67	18,33
490	1422,00	4251,43	442,71	16,16	638,87	9667,07	19,22
500	3855,00	5543,55	453,00	14,84	676,05	9385,75	18,10
510	2033,00	7068,93	456,19	23,10	718,85	9555,04	19,18
520	1984,00	10007,96	~~435,58~~	9,78	685,37	8864,69	19,08
530	4357,00	6126,49	440,18	13,36	656,95	9454,26	20,55
540	1289,00	7963,82	427,52	11,07	690,96	8720,93	17,66
550	1803,00	4312,21	416,46	17,03	638,73	9597,16	18,98

APPENDIX B (continued)

560	7296,00	8560,25	443,14	8,43	695,94	9597,02	18,76
570	1721,00	7057,57	447,58	4,45	607,80	9648,81	19,78
580	2580,00	6390,65	446,57	8,15	639,88	8670,86	20,00
590	4457,00	6194,75	440,62	14,94	641,20	9230,66	18,34
600	75242,00	6977,57	456,84	13,78	715,55	10420,39	19,71
610	77863,00	6926,47	445,88	14,98	690,73	9959,60	20,03
620	7632,00	6429,87	455,51	12,80	702,33	10495,83	20,35
630	5473,00	5969,95	449,79	16,08	751,67	10255,64	18,62
640	6131,00	4828,48	453,85	12,29	671,72	10295,70	19,40
650	1524,00	4638,34	438,20	9,91	713,86	10132,61	18,36
660	1853,00	5754,46	440,68	0,0	680,83	9915,16	19,30
670	2943,00	3975,17	450,27	10,92	675,93	9141,95	19,49
690	20497,00	4159,54	445,74	15,24	611,23	9572,49	21,20
700	30962,00	4718,79	451,13	13,78	648,97	9608,54	19,89
710	2245,00	5633,78	450,37	12,84	668,06	9795,31	20,23
720	214,00	3590,66	436,13	8,40	515,34	8815,80	21,40
730	1322,00	3143,15	447,82	12,78	556,56	9507,78	22,41
740	1867,00	3879,14	441,53	16,08	617,32	9885,57	20,98
750	296,00	5565,49	433,41	19,31	570,22	9196,84	22,77
760	850,00	4076,07	408,00	16,40	569,51	9016,63	21,25
770	504,00	5000,17	450,15	0,0	490,42	7797,35	21,91
780	587,00	2282,45	408,17	19,22	566,31	602,19	18,94
790	1696,00	2577,18	428,43	21,00	619,62	650,14	19,49
820	1485,00	3264,85	430,01	11,46	746,44	9742,33	17,47
830	1329,00	3607,99	436,42	16,46	650,12	10180,95	20,45
840	1332,00	3023,16	444,97	5,69	577,40	9050,58	19,88
850	543,00	5779,49	442,51	8,09	549,49	9020,44	21,72
860	971,00	2885,21	419,67	5,02	568,68	9044,02	19,82
861	1226,00	7010,22	456,19	13,61	697,46	9726,13	22,29
870	915,00	2923,65	426,04	9,18	586,53	8977,25	19,47
890	619,00	3632,08	442,96	7,74	577,88	10362,46	22,11
910	272,00	4305,80	339,86	21,89	584,03	8890,92	20,92
911	450,00	0,0	363,55	0,0	1012,16	10220,88	17,31
920	560,00	3863,80	412,89	6,34	538,64	9257,54	21,54

APPENDIX B (continued)

1310	119,00	1481,95	441,90	10,36	339,45	7888,25	29,75
1320	99,00	14616,92	418,55	10,40	599,34	7871,40	19,80
1330	53,00	9674,44	440,48	3,00	461,21	6013,66	17,67
1340	548,00	2844,90	427,43	15,56	572,23	9163,88	21,08
1360	1651,00	3416,23	435,38	12,23	601,34	8549,56	18,98
1390	679,00	15125,95	437,40	2,36	663,90	9518,57	20,58
1400	536,00	4159,54	421,00	20,18	609,69	647,33	19,85
1420	234,00	16011,10	430,79	12,23	621,90	9921,30	23,40
1430	724,00	10522,59	417,35	11,64	677,67	9491,73	19,57
1440	55,00	1417,37	238,80	15,71	920,47	11266,50	27,50
1450	19,00	16818,63	383,58	20,89	629,89	7200,00	19,00
1470	17,00	6167,22	450,56	14,64	469,59	6950,00	17,00
1480	102,00	1036,33	271,97	20,00	531,28	8392,00	20,40
1530	174,00	848,44	391,82	22,41	582,32	9633,38	21,75
1600	941,00	1947,77	451,87	16,71	566,15	9314,12	22,38
1971							
10	255,00	17822,70	395,85	18,10	938,68	11926,57	18,21
20	2913,00	6036,84	357,26	6,92	705,39	10784,53	22,58
30	820,00	16340,36	404,28	23,28	956,31	9345,78	14,91
40	3056,00	5320,91	474,37	17,90	745,25	11658,14	21,37
50	3257,00	6096,84	559,67	15,51	716,44	10366,24	18,61
60	1048,00	10394,24	447,88	13,00	771,56	8897,46	17,47
70	281,00	17248,70	493,04	16,50	1027,80	9444,06	16,53
80	3307,00	5542,69	454,26	14,27	695,14	9526,77	18,90
90	3711,00	4257,75	471,18	8,91	655,79	8657,63	18,01
100	5035,00	3992,25	466,85	19,58	683,93	9872,38	18,93
110	2757,00	3722,90	476,19	4,75	613,53	9648,72	21,88
120	820,00	8227,82	452,87	16,58	754,36	9728,98	17,45
130	1874,00	6402,79	474,05	13,23	707,80	9836,13	18,55
140	2303,00	6628,02	466,55	16,77	799,88	10312,71	17,19
150	2624,00	6374,17	481,56	14,26	698,26	9521,65	18,74
160	5487,00	5349,81	476,53	7,40	648,16	8924,33	19,60

APPENDIX B (continued)

930	2338,00	3533,98	430,73	21,00	642,85	8831,45	17,19
940	263,00	7267,41	429,57	15,12	583.03	9080,30	20,23
950	499,00	2104,59	417,65	6,30	611,55	8355,55	17.21
960	208,00	1404,58	428,37	11,00	549,51	8735,36	18,91
970	232,00	3014,24	455,39	7,80	562,08	7954,23	17,85
980	236,00	3660,22	441,61	10,40	489,40	7896,09	21,45
990	685,00	4764,23	425,56	13,62	645.11	8841,00	19,03
1000	421,00	1919,46	394,95	10,20	508,31	7842,90	20,05
1010	70,00	1462,74	220,05	10,00	447,00	7007,33	23,33
1020	234,00	2196,05	447,72	12,44	486.65	8115,18	21,27
1040	524,00	2956,33	418,78	14,27	572,76	9677,71	21,83
1060	549,00	3167,97	409,31	20,80	570,67	9660,70	20,33
1070	426,00	2878,88	424,87	7,62	542,26	9164,58	22,42
1080	313,00	1662,26	407,73	8,00	545,90	8057,44	19,56
1090	284,00	1719,32	406,48	6,65	584,72	8590,63	17,75
1100	207,00	3249,78	437,34	8,00	474,89	6615,73	18,82
1110	130,00	1313,76	414,33	17.00	446,53	7479,00	21,67
1130	181,00	1434,37	398,60	16,72	532,48	8774,55	20,11
1140	181,00	3142,13	456,66	15,27	545,29	8619,22	20,11
1150	248,00	2149,40	401,61	14,00	583,64	9263,46	19,08
1160	491,00	1415,51	417,00	24,30	587,04	9513,13	21,35
1170	225,00	2746,07	460,45	14,27	574,41	8877,91	18,75
1180	108,00	3163,94	212,61	4,50	562,45	6041,33	18,00
1190	249,00	3171,31	430,79	15,22	524,46	8318,91	20,75
1200	366,00	1865,98	412,79	7,92	491,37	7932,95	19,26
1220	312,00	6853,35	409,70	8,03	533,20	7983,56	19,50
1231	311,00	2099,48	394,06	8,36	518,01	8472,33	20,73
1232	378,00	1007,34	415,38	6,23	499,39	8629,55	21,00
1240	211,00	3757,72	414,56	11,56	607,86	10135.50	21,10
1241	382,00	4534,08	394,05	16,02	576,96	8742,90	19,10
1270	120,00	5780,14	414,34	9,13	542,94	9114,33	20,00
1280	132,00	3370,26	423,98	15,79	548,83	9588,50	22,00
1290	143,00	1859,19	446,51	9,14	471,67	8274,66	23,83
1300	112,00	1054,84	439,71	17,95	521,81	8061,00	22,40

APPENDIX B (continued)

170	2479,00	8459,71	510,47	5,87	671,21	8915,95	17,46
180	3157,00	6683,11	426,21	11,06	690,71	9298,11	17,44
190	1524,00	8498,04	461,16	9,94	750,44	9981,21	17,32
200	706,00	12801,24	462,65	7,45	694,48	9032,82	18,10
210	2170,00	5555,97	449,99	11,64	703,43	9748,97	17,79
220	1101,00	8804,66	454,83	5,86	679,16	8638,02	18,35
230	2804,00	4790,21	466,11	8,65	667,09	9784,63	20,93
240	3323,00	6529,40	471,84	9,50	676,18	10187.59	18,88
250	4131,00	8605,86	462,89	9,32	705,86	9245,58	18,04
260	2806,00	2524,94	452,54	8,00	646,69	8650,88	19,22
270	2055,00	4763,62	460,93	12,32	733,04	9307,84	19,21
280	3864,00	3004,54	470,91	9,09	663,19	10263,48	20,23
290	4791,00	5252,94	469,91	11,35	694,34	9554,49	18,01
300	1603,00	5371,87	452,19	10,20	648,45	9182,21	19,31
310	2287,00	1970,65	445,19	15,17	691,46	10132,70	19,89
320	1943,00	2218,87	379,51	20,22	761,91	10675,06	21,12
330	1782,00	2974,41	446,84	13,50	603,27	8961,13	20,96
340	1824,00	3974,71	393,45	0,0	672,46	9150,82	19,40
350	2135,00	8513,57	468,80	12,88	720,06	9320,30	17,79
360	2441,00	986,04	288,30	20,00	865,45	10442,51	18,49
370	2794,00	4681,68	447,69	17,01	689,75	9111,41	18,63
380	1809,00	10669,46	478,22	8,95	706,92	9037,01	18,65
390	3817,00	4751,55	474,26	15,73	731,31	10037,87	18,18
400	1675,00	6515,54	460,82	15,66	707,06	8897,99	17,09
410	2115,00	6131,93	483,28	14,63	752,57	10260,19	17,77
420	1137,00	13097,67	482,22	12,72	727,93	8583,86	17,49
430	1647,00	8656,44	472,59	8,61	704,12	10131,44	19,15
440	1441,00	9227,83	453,76	13,00	749,22	9135,84	16,56
450	2298,00	5703,93	472,93	16,35	738,96	9908,03	18,38
460	2353,00	5534,26	451,31	18,85	685,98	9446,50	18,98
470	2471,00	3754,44	468,05	6,08	623,09	8933,60	20,42
480	2576,00	3530,76	471,80	19,51	674,37	9437,11	18,53
490	1386,00	4633,81	474,74	15,35	672,29	9943,35	18,73
500	3796,00	5896,49	463,07	14,92	716,03	9751,12	17,57

APPENDIX B (continued)

510	1965,00	7621,73	464,59	19,42	720,79	9792.13	19,26
520	1992,00	10309,88	473,29	9,51	750,32	9233.05	19,15
530	4320,00	6381,11	460,66	13,36	660,51	9404.86	20,00
540	1248,00	7162,41	447,13	14,36	757,31	9294.16	16,42
550	1735,00	4688,63	442,78	16,27	702,16	10106,61	18,46
560	8183,00	7967,61	460,03	8,37	686,38	10293,97	19,12
570	1678,00	7107,90	481,60	5,00	651,43	10391.11	19.51
580	2538,00	6538,24	487,51	8,59	754,49	9195,74	18,80
590	4508,00	6194,43	469,46	14,35	683,20	9631.30	18,03
600	75652,00	7319.38	476,90	14,34	779,67	11233,29	19,29
610	79731,00	7293,86	472,93	15,40	758,90	10553,94	19,45
620	7737,00	6665,36	475,76	14,44	746.00	11259,03	19,54
630	5428,00	6034,41	475,59	17,08	799,79	11050,64	18.09
640	6060,00	5616,34	480,10	11,66	736,57	10706,48	18,48
650	1563,00	4707,61	467,97	8,90	751,87	10856,98	18.17
660	1827,00	6393,09	466,00	1.11	754.59	11089,20	18.84
670	3114,00	3962,06	480,71	10,35	717,23	9665.50	18,99
690	21349,00	4495,69	472,44	14,93	673,47	10524.90	20,55
700	31362,00	5233,60	479,34	14,34	711,38	10510,96	19,46
710	2295,00	5817,02	480,23	14,78	703,00	10416,93	19,45
720	223,00	3766,87	478,88	7,58	509,40	8284,73	20,27
730	1367,00	3207,60	474,94	12,99	619,50	10031,53	21.36
740	1857,00	4158,30	469,44	16,31	693,03	10669,82	19,76
750	297,00	5263,53	480,58	11,99	616,00	10063,30	22,85
760	914,00	3720,59	446,95	14,63	540,36	8461.95	21,76
770	486,00	5484,23	487,89	1,09	567,23	7981.13	20,25
780	617,00	2237,65	460,61	19,92	619,90	8944.39	18,70
790	1804,00	3117,72	465,31	22,90	661,64	10339,73	19,82
820	1492,00	3257,37	443,96	17,29	855,43	10069,70	16,22
830	1357,00	3868,66	476,91	9,95	701,74	9693,27	18,34
840	1136,00	4046,08	484,04	7,17	610,23	9067.33	18,93
850	525,00	6336,30	492,08	9,81	624,76	9734,34	20,19
860	889,00	3418,44	480,68	6,33	743,03	10919.35	19,33
861	1330,00	8749.97	479.88	14.79	778.66	9856.39	20,15

APPENDIX B (continued)

870	902,00	3075,32	445,59	8,80	610,70	8820.10	18,79
890	649,00	3813,04	474,60	7,06	602,52	10342,45	20,94
910	310,00	3957,16	401,20	12,97	607,54	7799,13	19,37
911	733,00	2346,63	436,68	19,61	843,25	10480,54	18,79
920	504,00	5160,84	464,91	7,01	581,27	9695,75	21,00
930	2505,00	3630,09	456,66	22,92	681,77	9653,94	17.77
940	263,00	8072,97	481,42	16,80	642,24	10383,46	20,23
950	493,00	2289,93	457,22	9,99	673,76	9248,64	17,61
960	205,00	1438,29	491,13	10,83	616,32	8309.58	17,08
970	231,00	2844,45	511,23	8,27	550,76	7693,83	19,25
980	247.00	3729,24	502,00	9,02	519,82	8384,66	20.58
990	735,00	6146,95	478,74	14,61	669.02	9413,43	19,86
1000	432,00	1951,91	434,61	10,20	547,24	8526.18	19,64
1010	69,00	2006,01	261,38	12,32	530,29	7598,66	23,00
1020	230,00	2006,21	477,30	11,16	521,29	7701,16	19,17
1040	534,00	3759,48	463,25	14,27	577,75	9303.38	20.54
1060	567,00	3107,40	472.32	20,48	572,53	10090,73	21,81
1070	433,00	2900,00	471,70	16,21	593,48	9471.35	21,65
1080	296,00	1691,13	468,25	8.00	688,23	8121,50	18,50
1090	287,00	1930,28	472,32	7,66	600,78	9757,00	19,13
1100	201,00	3449,39	500,40	8,00	554,34	7196,33	16,75
1110	136,00	1239,23	480,01	16,99	489,02	6855,14	19,43
1130	197,00	1416,00	508,24	16,90	544,67	10796,12	24,62
1140	184,00	4306,20	670,02	15,27	593,73	9578,44	20,44
1150	244,00	2314,73	462,02	12,93	578,31	9723,25	20,33
1160	434,00	1886,74	486,53	19,00	676,32	10610,76	20,67
1170	207,00	3059,12	532,75	14,27	585,15	9875,80	20,70
1180	116,00	3047,66	247,32	4,37	501,26	7113,66	19,33
1190	220,00	3758,21	470,74	14,67	578,54	8541,63	20,00
1200	357.00	1976,14	469,99	7,66	583,33	8157,95	17,85
1220	321.00	6530,32	469,83	8,63	522.89	8339,13	20,06
1231	309,00	2654,35	424,60	1,29	577,33	8980,00	19,31
1232	397,00	1135,50	450,28	4,66	499,83	8836,16	20,89
1240	195,00	4030,08	492,29	12.50	611,41	9651,40	19,50

APPENDIX B (continued)

1241	382,00	4799,37	437,36	15,86	630,97	9860,10	19,10
1270	124,00	5516,85	514,69	8,90	527,77	8822,33	20,67
1280	124,00	3508,79	484,64	13,38	603,50	10166,16	20,67
1290	137,00	1977,12	487,65	13,00	593,83	8407,86	19,57
1300	112,00	1524,58	505,02	17,00	562,96	8196,80	22,40
1310	107,00	1672,04	500,75	5,93	453,71	8729,75	26,75
1320	92,00	15527,45	503,93	9,85	720,18	8399,40	18,40
1330	49,00	9390,19	501,02	2,48	581,88	6198,33	16,33
1340	551,00	2969,87	486,94	10,00	607,24	9077,14	20,41
1360	1656,00	3367,44	458,71	12,48	667,97	9039,18	18,20
1390	670,00	15132,49	459,93	2,67	687,25	8791,77	19,14
1400	527,00	5632,20	451,37	18,44	675,02	9620,14	19,52
1420	252,00	15645,70	488,23	9,39	747,75	10508,41	21,00
1430	748,00	10574,59	431,39	13,43	725,16	10120,95	19,68
1440	105,00	2630,51	296,72	9,83	780,46	10455,00	26,25
1450	21,00	21172,38	517,81	13,82	649,95	7799,00	21,00
1460	22,00	51864,09	538,14	2,96	1052,45	8197,00	11,00
1470	9,00	10412,22	550,00	17,34	685,89	10640,00	18,00
1480	103,00	1478,77	456,37	20,00	575,53	8612,00	20,60
1530	160,00	923,28	462,00	20,00	592,62	8404,87	20,00
1600	1222,00	2192,17	553,92	12,27	553,42	10688,27	25,46